MARCH 26, 1951

Electrical World

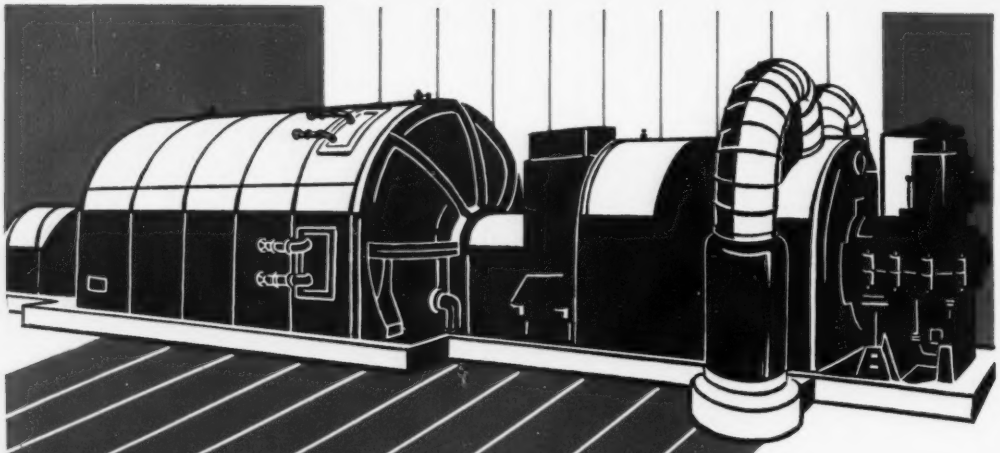
Price 35 Cents

A McGRAW-HILL PUBLICATION

Should we keep on selling!

That's the question these five utility executives are considering. For what they decided .....

See page 99



KEEP TURBINES "ON THE LINE"

. . . Lubricate with TEXACO REGAL OILS (R&O)

With production demands at their peak, unscheduled shutdowns simply must be avoided. Your best bet for getting rid of these worries is to lubricate your turbines with *Texaco Regal Oils (R & O)*. Texaco Regal Oils were world-famous turbine oils long before rust- and oxidation-inhibiting additives were developed. Today, *with* these additives, *plus* special processing to prevent foaming, *Texaco Regal Oils (R & O)* far outclass any ordinary turbine oil.

Texaco Regal Oils (R & O) are the turbine lubricants with the "extras." Extra resistance to rust, sludge and foam . . . extra protection for bearings and assurance of sensitive and alert governor action . . . extra-long oil service life. All these add up to a greater margin of safety and lower maintenance costs.

Texaco Regal Oils (R & O) are available in proper viscosities for all operating conditions and are approved by leading turbine builders.

Let a Texaco Lubrication Engineer guide you toward efficiency and economy throughout your power plant. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

TEXACO

TEXACO Regal Oils (R&O)

FOR ALL TURBINES

TUNE IN . . . TEXACO presents MILTON BERLE on television every Tuesday night. See newspaper for time and station.

WHAT THEY'RE SAYING

Industry leaders in interviews or speeches frequently make statements of interest to others in the industry. And persons in other walks of life often make comments that are worth recording. "Electrical World" will do just that in its new department, "What They're Saying."

The new department makes its first appearance on Page 162 of this issue. From now on each "big book" (the one that contains technical and engineering articles as well as news) will carry two or more columns of these "meaty" statements. This week you will find comments on the future of atomic energy, isotopes, and personnel problems.

But for comments of our readers on everything from advertisements to zebras which eat power poles, the "Letters to the Editor" department may be found on the last page.

UTILITY SECURITY

With airplanes crossing the ocean as if they weren't there and with Russia (according to what we have been told) being the proud possessor of some atomic bombs, a future war is likely to be a lot tougher on the United States than were the last two. Electric utilities must plan for their own security before the bombs start falling. To help them plan, EW's April 9 issue will carry an eight-page article on this problem.

The article summarizes the lessons taught by the bombing of Hiroshima. So far all that is known of the effect of an A-bomb attack on electric utility facilities is based on the elaborate and thorough studies made by American engineers of the damage to the Japanese city and utility system.

Other sections of the story tell how to set up an organization to restore service after emergencies, what communication facilities are needed, and how to protect against espionage and sabotage. Well geared coordination with Civil Defense authorities is also stressed.

SUBWAY-TYPE TRANSFORMER STANDARDS

Another important article soon to appear will discuss and interpret the new Edison Electric Institute standards for subway-type transformers. Engineers in the distribution field of the industry will find it is "must" reading if they are to keep up-to-date on this increasingly important subject.

THE EDITORS

Electrical World

Published for 77 years for those engaged in the business of generating, transmitting, distributing applying electric power

Vol. 135 No. 13 — March 26, 1951

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NEW JOINT REINFORCING SLEEVE

OKOMETAL TAPERED
LEAD REINFORCEMENT
USED IN GARRISON JOINT

TRIPLES LIFE OF POWER CABLES

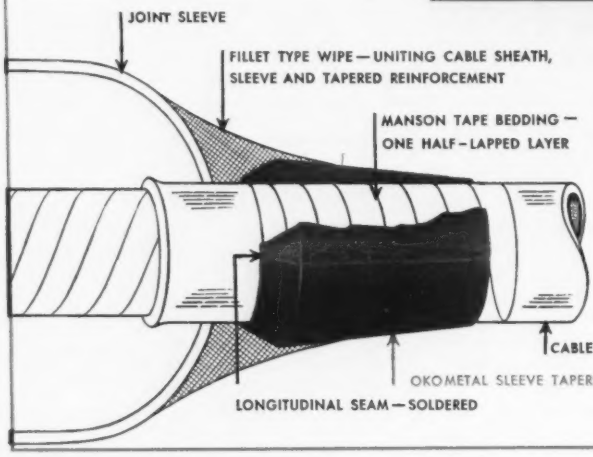

JOINT SLEEVE
FILLET TYPE WIPE—UNITING CABLE SHEATH, SLEEVE AND TAPERED REINFORCEMENT
MANSON TAPE BEDDING — ONE HALF-LAPPED LAYER
CABLE SHEATH
OKOMETAL SLEEVE TAPERED TO DISTRIBUTE STRESS
LONGITUDINAL SEAM—SOLDERED

DIAGRAM OF GARRISON JOINT* FOR PREVENTING SHEATH CRACKING—Okonite-Callender's Garrison Joint can be applied to existing cables as well as new installations—on either plain lead coverings or on lead cables with protective coverings. Optimum results are obtained when used with Okosheath Protective Covering.

* PATENT APPLIED FOR

A major cause of paper insulated power cable failure is cracking of the lead sheath at joints, due to cyclic bending in manholes. Main source of this trouble is the concentration of stress at the joint wipe.

Okonite-Callender's new GARRISON JOINT offers a simple and economical solution to this problem by distributing the stress along the cable instead of allowing it to concentrate at the joint.

Key to the long-life effectiveness of the GARRISON JOINT is the tapered Okometal sleeve illustrated. This lead sleeve wraps around the lead sheath of the cable, and is fused into the wipe. Result is a reinforcement which, by distributing stress, prolongs the bending fatigue life of cable to *three times* its normal value.

The Okonite-Callender GARRISON JOINT is practical and simple to install, differing from a normal joint only in the use and method of applying the tapered sleeve. Sleeve can be used with almost any joint assembly.

Ask your Okonite representative to show you how simple it is to make the GARRISON JOINT. Or write for a copy of Bulletin EW-1051, to The Okonite Company, Passaic, N. J.

THE BEST CABLE IS YOUR BEST POLICY

OKONITE SINCE 1878 ***insulated wires and cables***

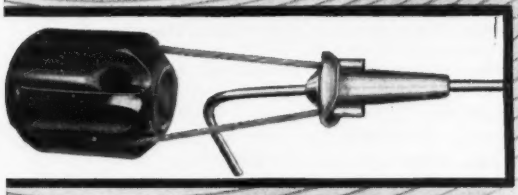
8973

Electroline

AUTOMATIC DEAD-ENDS

"AS GOOD AS NEW" AFTER TORTURE TEST

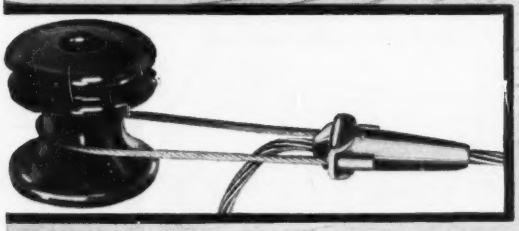
Electroline AUTOMATIC DEAD-ENDS are continually subjected to gruelling tests for strength, gripping and vibration damping features. In a typical test, 100,125,000 recorded vibrations did not develop any sign of failure of conductor in these dependable Dead-Ends. Month after month, day and night, these Dead-Ends held their positive grip and retained the full strength of the conductors. Engineers compute that the Dead-Ends withstood the equivalent of 50 years of ordinary service and state that they were as good as new at the end of the test.



3400-SERIES

The 3400-SERIES consists of an Electroline Automatic Connector, a yoke and flexible bail. These three are permanently interlocked once the conductor is inserted to form a complete unit that fits either strain or spool-type insulators.

This series permits the feeding of the conductor through the connector, eliminating the use of taps in the line span. The damping features incorporated in Electroline Dead-Ends prolong the life of conductors by preventing crystallization at the point of connection. They insure full line strength and save on construction costs by their quick and easy installation. These economical Dead-Ends can be reclaimed and used again. But, once installed, the conductor is there to stay; it cannot become detached until released by a lineman.



FOR COMPLETE DETAILS WRITE FOR BULLETIN.

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Electroline Company

4121 South La Salle Street • Chicago 9, Illinois

In Canada: POWERLITE DEVICES, LTD., TORONTO

TOTALLY ENCLOSED 22 KV

Supplant Conventional Open Designs on Duquesne Light Company Systems

Duquesne Light Company for many years urged the development of an arc-free air switch that could be metal-clad, yet capable of interrupting load and charging currents at 22 KV.

Such a switch was needed for their 22 KV loop and double tap systems to permit the total enclosure of unit substations, successive steps towards which had been taken in recent years, as pictured here, by enclosing the secondary switchgear and by placing underground the secondary, then the primary connections. All that remained exposed was the primary switchgear.

Following the S&C development of 23- and 34.5-KV interrupter switches, the metal-clad switchgear unit shown on the right was designed jointly by Duquesne Light Company and S&C. The result is the totally-enclosed 2000 KVA unit substations shown below, on which they comment:

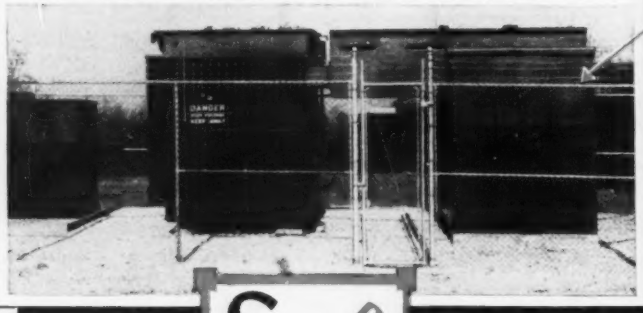
> **"It was found . . . because of the proximity of various hazards, small sites, and safety against external interference . . . that the totally enclosed job permits a satisfactory and safe installation that might have to be located elsewhere if these features had not been developed. In fact, the totally enclosed job will be used in all future installations with few, if any, exceptions."**

S&C Metal-Enclosed Switchgear, using Alduti Interrupter Switches and Type SM Power Fuses, probably offers many advantages for your system also, including low original and maintenance costs. Your inquiry is invited.

The details of Duquesne Light Company's unit substation program are presented in a paper entitled "The Application of Unit Substations" by W. P. Holben and C. N. Hoffman. Copies will be sent on request.

1950

22 KV and 4 KV Underground; switchgear totally enclosed



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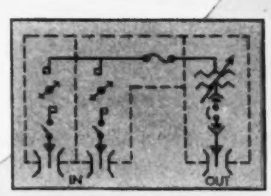
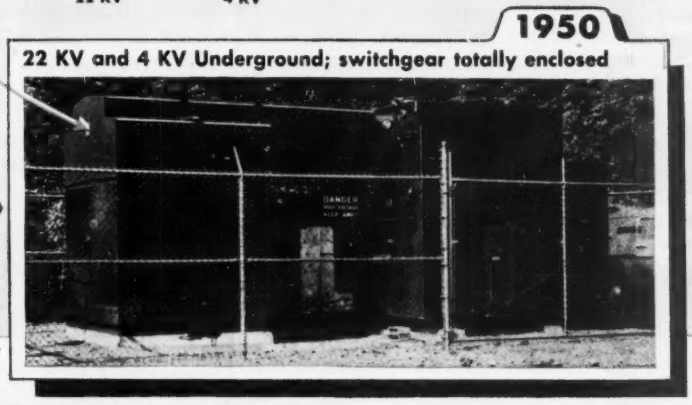
S&C ELECTRIC

Formerly SCHWEITZER & CONRAD, INC.

SUBSTATIONS





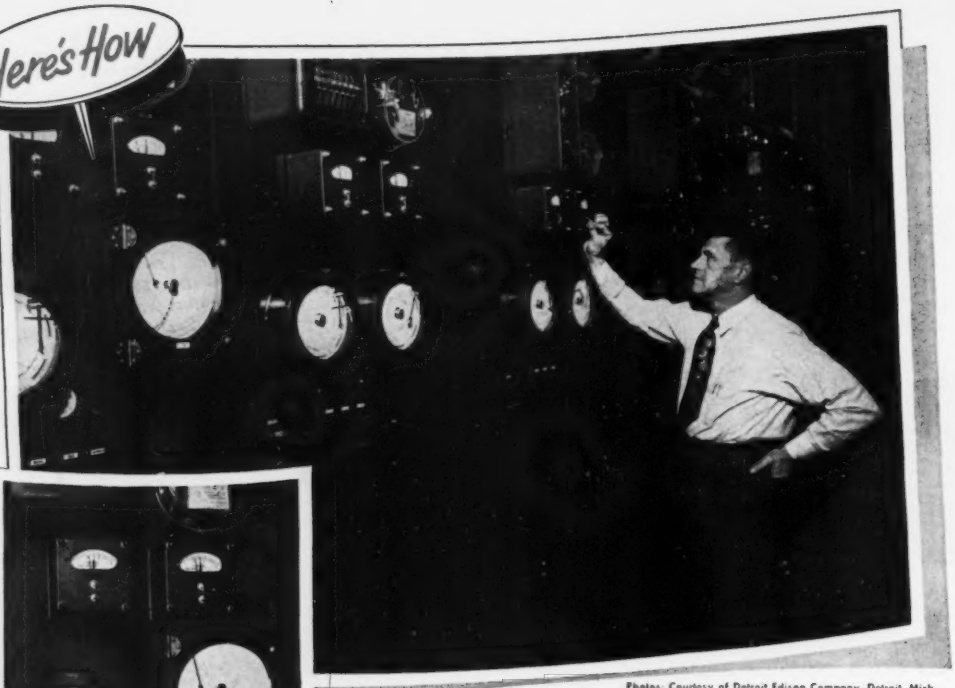
50

COMPANY

4421 Ravenswood Avenue
Chicago 40, Illinois, U. S. A.

In Canada, Powerlite Devices, Limited, Toronto

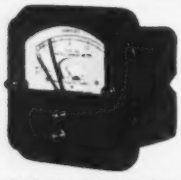
Here's How



Photos: Courtesy of Detroit Edison Company, Detroit, Mich.

You can get the maximum out of your existing Distribution Equipment

LINCOLN TYPE AD-2
Ampere Demand Meters



LINCOLN TYPE CCA
Graphic Demand Meters

To load your distribution system to the ultimate safe limit, you *must* know the load on your feeders. Lincoln Ampere Demand Meters give you the facts you need—on the basis of *continuous* information—to keep the loads between feeders balanced.

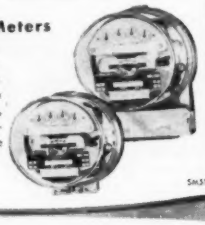
Type AD-2 Thermal Ampere Demand Meters show the demand on the feeder phases at all times as well as the maximum demand reached since the last manual resetting.

Type CCA Graphic Ampere Demand Meters provide an accurate and reliable means of ascertaining this information wherever a record of the time and duration, as well as the magnitude, of the demand is required.

Bulletins 450, 461 and 467 tell the whole story—write for your copies.

Sangamo J Meters

These watthour meters meet today's requirements and tomorrow's anticipated loads with sustained accuracy, economy of maintenance and troublefree performance.



SM51-4

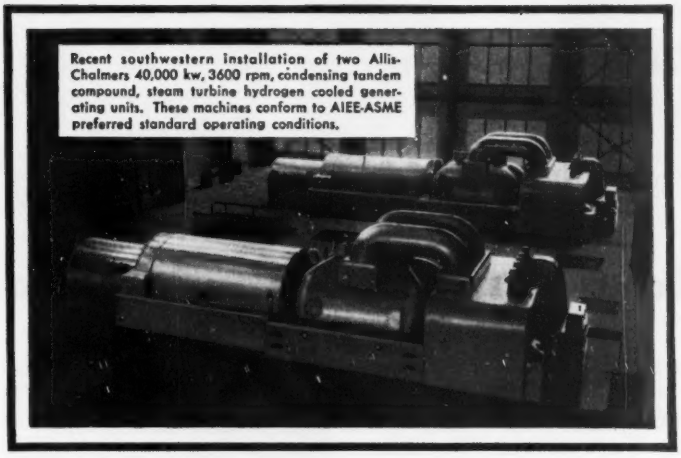
Only Measured Facts are Known Facts

SANGAMO ELECTRIC COMPANY

SPRINGFIELD, ILLINOIS

Vital Aluminum Production Aided by

STEAM TURBINE GENERATORS!



Recent southwestern installation of two Allis-Chalmers 40,000 kw, 3600 rpm, condensing tandem compound, steam turbine hydrogen cooled generating units. These machines conform to AIEE-ASME preferred standard operating conditions.

POWER IS PRIMARY in producing aluminum. It is used directly, and in large amounts, for the electrolytic reduction of alumina.

Major U. S. deposit of bauxite ore producing the critically needed aluminum is in Arkansas. All of which adds to the importance of the above new steam turbine generator units at the Lake Catherine steam-electric station of the Arkansas Power & Light Co.

Installed in 1950, these two 40,000 kw hydrogen cooled units generate all the power produced at the Lake Catherine plant. They run 24 hours a day, with the majority of their power being used in aluminum production.

Like all Allis-Chalmers steam turbine generators, these units are built to high economy, high quality standards. One example is labyrinth steam seal glands, obtaining their steam supply in part from the leak-offs of control valve stem packing.

Steam seals only are used in the entire line of Allis-Chalmers steam turbine generator units, ranging from the smallest single cylinder machines to the largest cross-compound types. Their inherent freedom from operating hazards increases reliability. This is one of the many ways Allis-Chalmers simplifies turbine operation.

When you plan the installation or expansion of a steam-electric power plant, put *80 years* of steam power experience to work for you. For specific information on a *complete* line of electric power equipment, call your nearest A-C office or write to Allis-Chalmers, Milwaukee 1, Wis. A-3317

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TURBINES & GENERATORS | CONDENSERS & PUMPS | SWITCHGEAR & BREAKERS | MOTORS & CONTROL | TRANSFORMERS | WATER CONDITIONING

World's Widest Range of Power Plant Equipment

YOU NEED ALL 3

...for long-range distribution economy!

Calculate your probable fuse replacement costs over the next fifteen years—the period in which forecasts say loads will triple. We'll guess your answer suggests need for a less costly protective system. Ideally, it would be a system which eliminated fuse replacement costs... which stayed in perfect co-ordination *permanently*... which simplified the job of system sectionalizing on rural and suburban lines.

The units pictured above are components of a system which *does fulfill these requirements!* It's a completely mechanical system which employs Type 100-GR reclosers or reclosing breakers at the substation, and Type 50-GR reclosers co-ordinated with sectionalizers on the line. For forward thinking system planners it represents a *sure* way to gain this important objective:

THE HIGHEST DEGREE OF SERVICE CONTINUITY AT THE LOWEST LONG-TERM COST!

The mechanical protective system is just one of those analyzed in Booklet B-4700, which covers advantages, limitations and cost considerations of all types of protective schemes for rural and suburban lines. For your copy of this practical guide to better protection planning, write: Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania.

J-60739

YOU CAN BE SURE... IF IT'S
Westinghouse
DISTRIBUTION APPARATUS

For LOW-COST LIGHTNING PROTECTION that's PERMANENT use Copperweld* Ground Rods and Clamps

Struck 12 times during a single storm and 48 times in one year, the Empire State Building disproves the old saying that "lightning never strikes twice in the same place."

YOU NEVER KNOW WHERE, WHEN, OR HOW OFTEN LIGHTNING WILL STRIKE . . . but you can secure safe, permanent and economical grounding protection when you install Copperweld* Ground Rods and Clamps. For every grounding application requiring the use of driven electrodes, these superior ground rods offer you these important advantages:

1. *Molten-Weld*—Permanent interlocking weld between the copper and alloy steel eliminates possibility of electrolytic action. No other ground rod has this inseparable union, accomplished only by the proved Copperweld Molten-Welding process.
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3. *High Conductivity*—Copperweld's thick sheath of pure copper provides excellent electrical conductance. Copper-to-copper contacts throughout insure low resistance.
4. *Protection Against Rust* — Copperweld's heavy copper armor permanently protects the alloy steel core against corrosion.
5. *Greater Economy* — Longer service life with no maintenance costs.

Start now to reduce outages and insure continuity of service by using Copperweld Ground Rods and Clamps. They provide safe, permanent, low-cost grounding protection at all types of locations—at poles, at towers, at power stations, at substations, at buildings — and for all grounding purposes.

MADE BY COPPERWELD STEEL COMPANY GLASSPORT, PA.

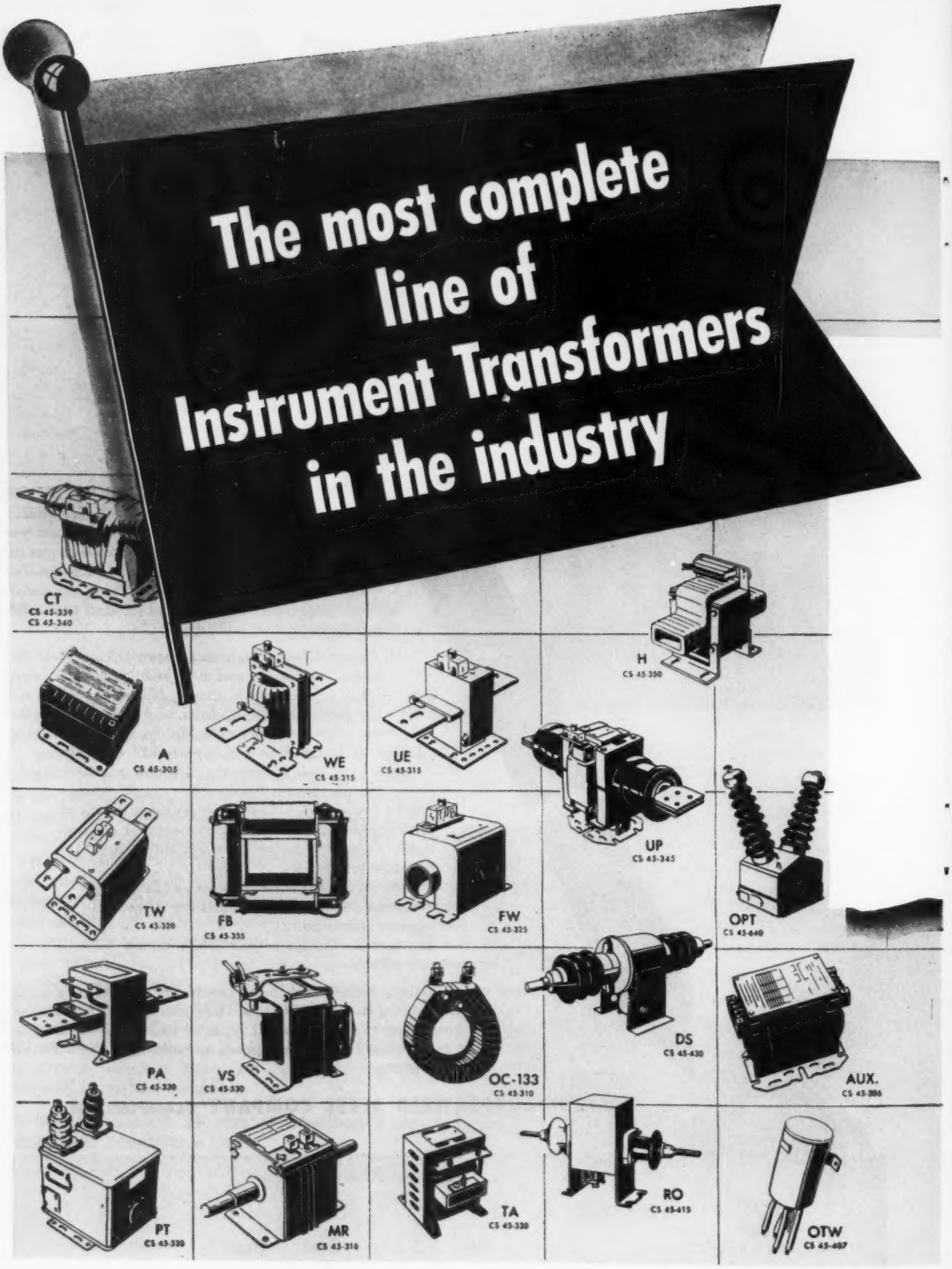
*Trade Mark

COSTS YOU LESS Copperweld BECAUSE IT LASTS LONGER

Stocked And Sold By:

HUBBARD AND COMPANY • JOSLYN MFG. & SUPPLY CO.

And All Their Distributors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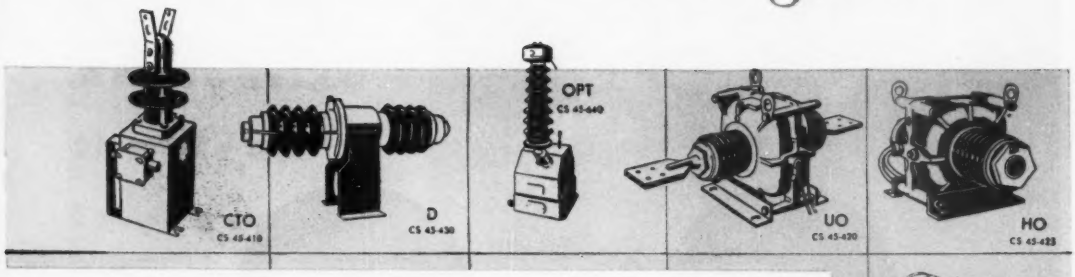
YOU CAN BE **SURE**.. IF IT'S

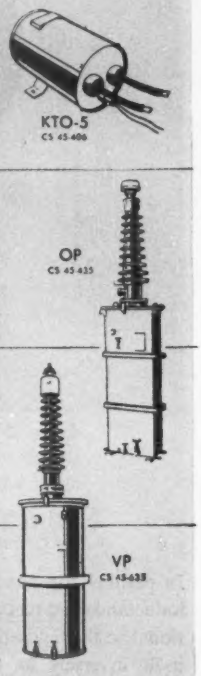
Westinghouse

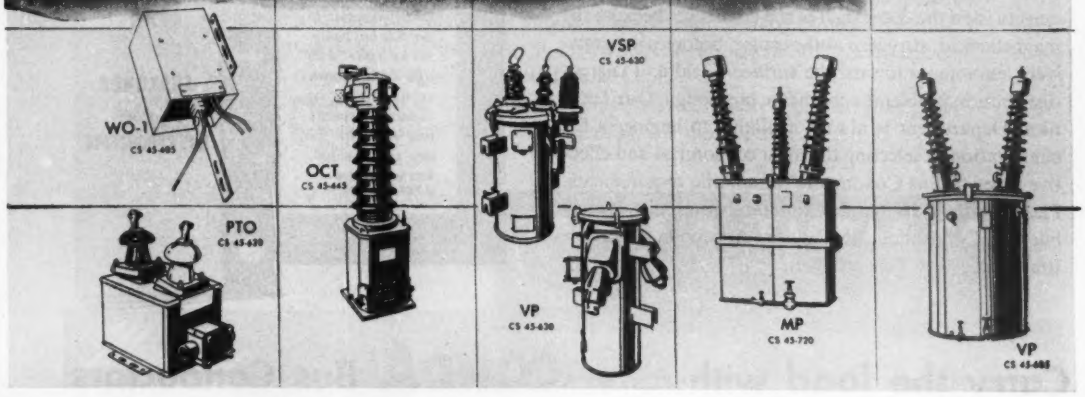


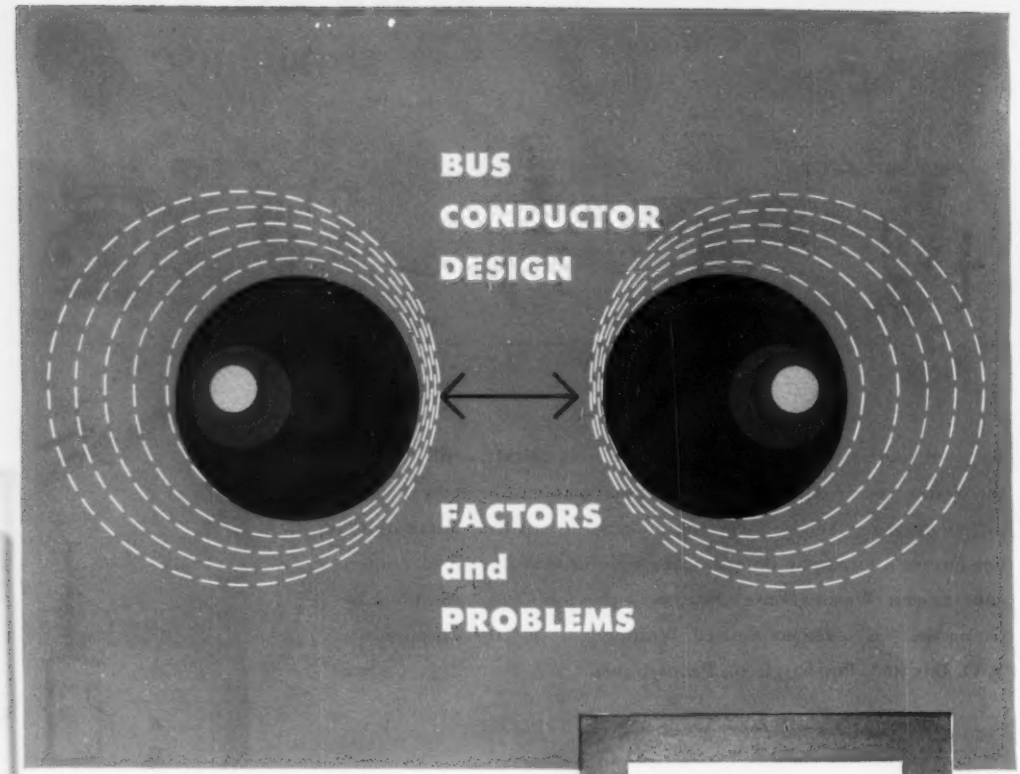
Solve all your instrument transformer problems quickly, easily! Turn to the Westinghouse salesman. He has the most complete line in the industry . . . for metering, relaying, current, potential or auxiliary applications. For further information on any of the transformers illustrated, contact your nearest Westinghouse office, or write for Catalog Sections by listing the "CS" numbers desired. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-70573

Westinghouse

INSTRUMENT TRANSFORMERS







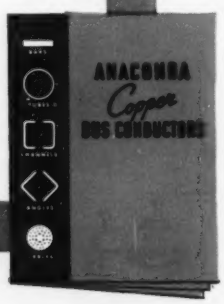
Skin and Proximity Effect

In parallel rod conductors for alternating current the inductance and reactance of each rod is directly proportional to the field around it, and the current distributes itself inversely as the reactance. Maximum current density is on the outer shell of the conductor because the magnetic field, strongest at the center, becomes progressively less intense toward the surface. Field and current distribution problems complicate bus design. Our Technical Department is always available to engineers for consultation in selecting the most economical and effective types of Bus Conductors for specific requirements. Please address The American Brass Company, Waterbury 20, Connecticut. In Canada: Anaconda American Brass Ltd., New Toronto, Ont.

Anaconda a Bus Bar pioneer

Since the beginning of electric power development in the United States, Anaconda has served the industry with efficient conductors. Today ANACONDA *products, techniques and technicians are cooperating effectively throughout the entire field of power generation, distribution and application to provide bus equipment that will afford an optimum combination of capacity, security and economy for any specified job.*

Write for new edition of Publication C-25.



Carry the load with ANACONDA Bus Conductors

Announcing the New, Improved

BIDDLE IMPULSE CABLE FAULT LOCATOR

RATED UP TO 25 kv.

HIGHER VOLTAGE—25 KV. INCREASES ITS USEFULNESS for proof, repair, and service tests on cable installations with voltage ratings up to 15 kv., as well as in cable fault locating.

IMPROVED DETECTOR PERFORMANCE; new techniques developed as result of field experience.

CURRENT MEASUREMENTS ARE NOW INCLUDED FOR PROOF TESTING which permits the measurement of leakage or incipient fault current during proof testing; helps to determine the condition of cable and other electrical equipment.

MEETS MOST NEEDS FOR LOCATING FAULTS, on duct-installed cable up to 34.5 kv.

The Biddle Impulse Cable Fault Locator has been developed primarily for locating faults on lead-covered cable installed in ducts. It has applications also on aerial and buried cable, and has proved highly effective in utility and industrial service. In operation, the set is essentially independent of the type of fault or its apparent resistance, and depends only on the impulse voltage required to break down the fault.

Equipment now in use in various industries has *scored high* in fault locating, and has made real savings in both time and money.

Keep in touch with us on Cable Fault Locating—we will gladly consider your problems and keep you informed on the progress of our development.

Request your copy of Bulletin 65-W today—it discusses the Biddle Impulse Cable Fault Locator interestingly and thoroughly.

JAMES G. BIDDLE CO.

Electrical & Scientific Instruments

1316 ARCH STREET, PHILADELPHIA 7, PA.

"Megger"® INSULATION TESTERS • GROUND TESTERS • OHMMETERS

Combined features that distinguish Foster Wheeler package steam generators

WATER TUBE DESIGN	Vertical tubes,...steady water level, closely spaced waterwall tubes on 3½" centers
FACTORY ASSEMBLED STEAM PLANT	Compact, self-contained steam generating units
WIDE RANGE OF CAPACITIES	7,500 to 30,000 lb per hr . . . flexible multi-unit installations for greater capacities
HIGH STEAM TEMPERATURES	Provisions for superheaters in some designs
PORTABILITY	May be transported by common carrier . . . minimizes problems of initial installation and plant relocation
EXPERIENCE	50 years' design, engineering, manufacturing of power plant equipment behind each Foster Wheeler unit
EASILY INSTALLED	Simple foundations . . . few service connections
OUTDOOR INSTALLATION	Rugged, steel encased construction
ACCESSIBILITY	For inspection,...cleaning, maintenance
COMBUSTION CONTROLS	Fully or semi-automatic controls for single or multi-unit installations
CONTROL VALVES	Equipped with 3-valve by-passes
CLEAN HEATING SURFACES	Soot blowers incorporated . . . cleaning without boiler shutdown
HEAT LOSS MINIMIZED	Minimum heat loss—from radiation and air infiltration
RAPID LOAD SWINGS	Large diameter drums and ample furnace heating surface

all for the

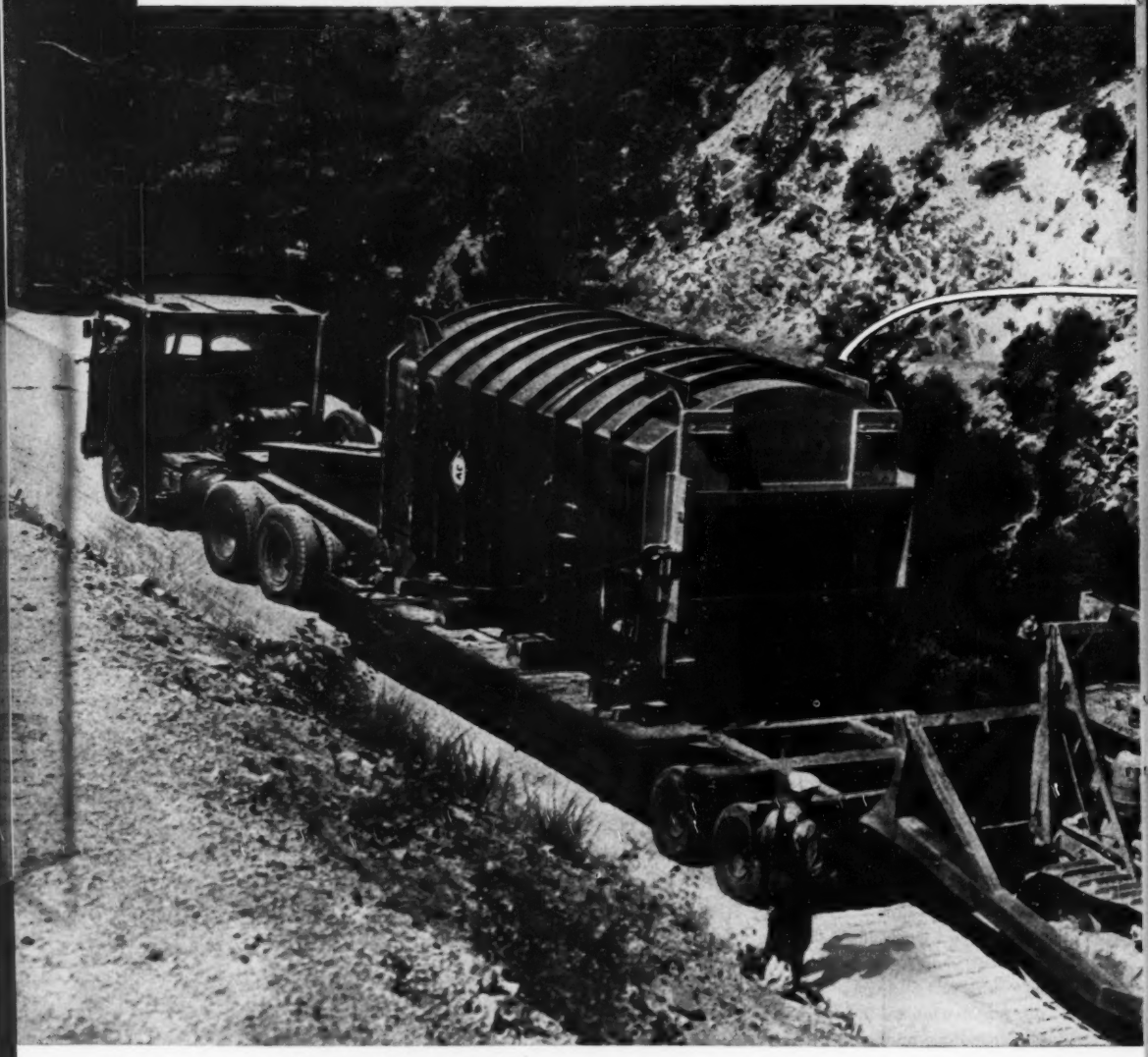
price of a PACKAGE

Your operation deserves a *real* steam plant. Today, mounting orders from large and small companies alike testify to the fact that Foster Wheeler Package Steam Generators are supplying industry's answer to the need for a compact, highly efficient source of steam. These units assure economy in the cost of steam production and high availability. They are easily installed and adapted to various fuel and firing arrangements. The Foster Wheeler Package Steam Generator presents a relatively inexpensive way to modernize your plant.

FOSTER WHEELER

For further information, write FOSTER WHEELER CORPORATION • 165 BROADWAY, NEW YORK 6, N. Y.

ANOTHER SHIPMENT OF



Shown here is the first of four Allis-Chalmers corona-free transformers being delivered to Pacific Gas and Electric Company's Cresta Power Station in the Sierra Nevada mountains. All four transformers are shell type and are rated 25,000 kva, 240,000/11,500 volts.

ALLIS-CHALMERS

Corona Free TRANSFORMERS

RECENTLY, THE PACIFIC GAS AND ELECTRIC COMPANY boosted the capacity of its transmission system with four Allis-Chalmers corona-free transformers. And because these transformers are free of the destructive effects of corona, they will stay young for years!

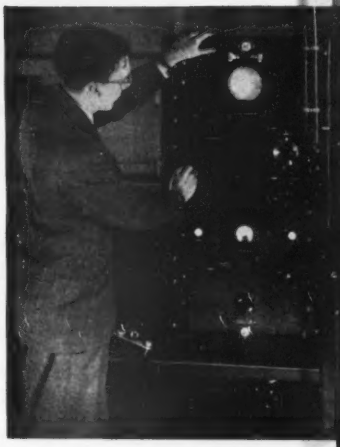
Internal corona discharge has been a frequent cause of transformer failure. It shortens transformer life by attacking insulation, causing a gradual weakening of transformer impulse strength.

Allis-Chalmers engineers set out to eliminate corona right at the source — sharp corners and other places of high voltage stress. Their oscillograms indicated when and where corona was occurring. By rounding and shielding vulnerable parts of terminal boards and by redirecting dielectric fields, they "knocked out" injurious corona. Then, with the help of calculating boards, they analyzed transient phenomena, thus enabling them to locate critical areas and replace free space with corona-resisting material.

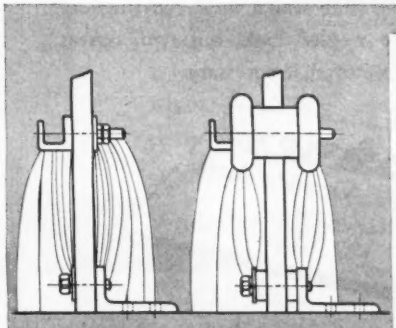
Results: Allis-Chalmers transformers are now completely free of corona. They retain their full impulse strength even after repeated surges from lightning or switching. Allis-Chalmers, Milwaukee 1, Wis.

A-3335

1. CALCULATING BOARD helps engineers solve complex transformer problems and makes possible detailed analysis of transient phenomena. Transformer equivalent circuit is set up on the calculating board for initial voltage measurements. From readings obtained the amount of insulation required at every point in the transformer is determined.



2. IMPULSE WAVE is examined by engineer J. H. Moran during voltage distribution test. Transformers receive a reduced voltage test when partially assembled. Full test voltages are applied to the finished transformer, using the oscilloscope as a further check on calculating board figures. Voltage measurements are carefully checked.



3. Electrodes in immediate contact with an insulating panel submerged in oil tend to develop corona and streamers that flash to ground.

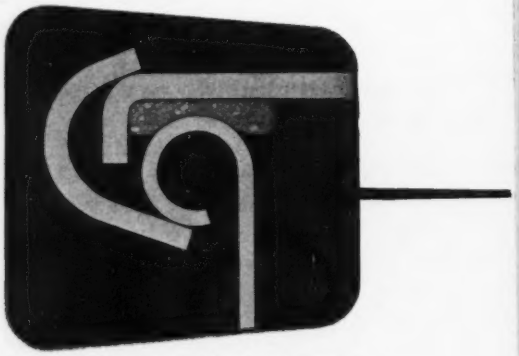
The *before* and *after* sketches shown indicate what has actually been done to make these high voltage units completely safe from stresses. Tap changers can now do their work without danger of breaking down after countless lightning or switching surges have struck the transformer.

NEW Wagner Wagner

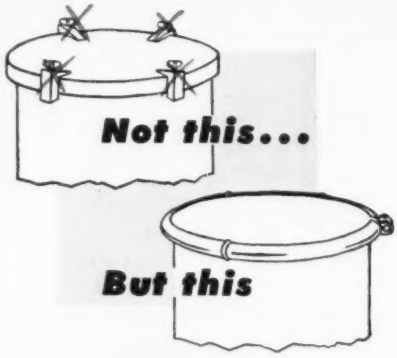
ASSURE SEALED-TANK CONSTRUCTION
LONGER TRANSFORMER LIFE
LOWER MAINTENANCE COSTS

The SHUR-SEAL Clamping Ring has three grooved channels which prevent water from accumulating on the cover.

Wagner Form W Transformers with the exclusive Wagner SHUR-SEAL Cover . . . *plus* Wagner Inhibited Transformer oil assure maximum protection against deterioration produced by "breathing" during the daily load cycle. Loss of oil during shipment or handling is also prevented. The SHUR-SEAL Clamping Ring maintains uniform pressure *around the entire periphery* of the cover—and yet permits easy removal of the cover by loosening a *single* stainless steel bolt. Wagner Form W Transformers offer sealed tank construction, air-tight as a welded tank, but with covers that can be removed if necessary.



Here's how the Wagner SHUR-SEAL Clamping Ring securely locks the cover to the tank. Corprene gasket is compressed to assure an air-tight seal.



The Wagner SHUR-SEAL Clamping Ring maintains *equal* pressure all around the cover.

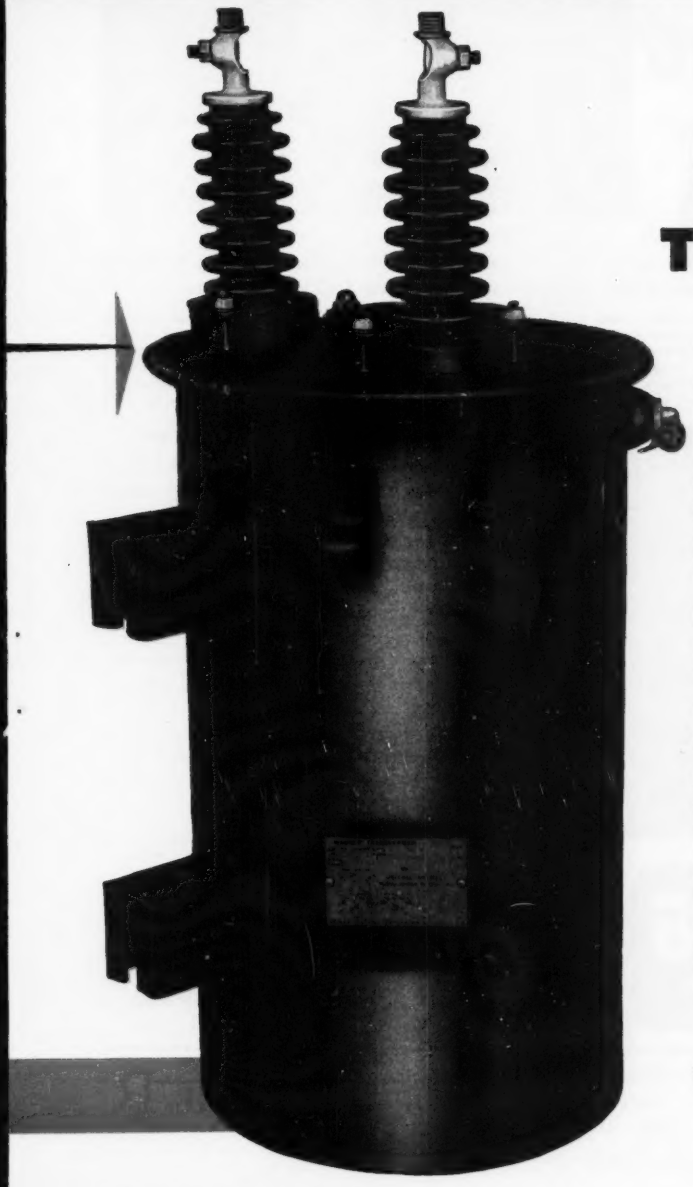
Wagner Electric Corporation
EST. 1891

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES
AUTOMOTIVE BRAKE SYSTEMS — AIR AND HYDRAULIC

T51-1

BRANCHES IN 31 PRINCIPAL CITIES

SHUR-SEAL Cover Inhibited Oil



Wagner

Form W

Transformers

Wagner Form W Transformers, with preformed cores of cold rolled oriented grain steel, are small in size, light in weight, yet are liberally designed. They are easy to handle, to store, and to mount on poles.

They give you excellent electrical performance . . . core and copper losses are low—regulation at both 100% and 80% PF is good—and exciting current is extremely low. High short time overload capacity provides good peak load performance. Form W Transformers are built to pay dividends in extra service—because they're built the Wagner way—with sixty years of transformer building experience behind them. Why not investigate them today?

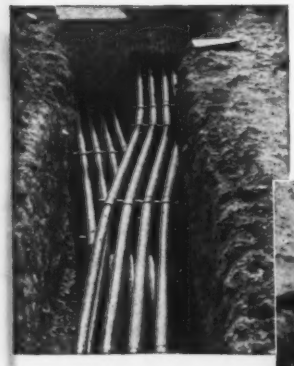
Wagner Electric Corporation
6456 Plymouth Ave., St. Louis 14, Mo., U. S. A.

"Well protected cables keep power flowing

That's why I specify

ORANGEBURG"

—says the Utility Engineer



ORANGEBURG STANDARD

. . . installed with concrete encasement. The preferred conduit for banks of three or more ducts.

ORANGEBURG NOCRETE

. . . installed without concrete encasement. Its extra heavy wall makes NOCRETE practical for many single or double duct runs.

Here are some of the ways by which Orangeburg® Fibre Conduit protects cables and wins the confidence of Utility Engineers.

• Will not corrode. Lasts indefinitely. • Impermeable wall and tight joints prevent corrosive ground waters from entering. • Lays faster and at lower cost than any other type of conduit. • Low coefficient of friction keeps pulling tensions on cable to minimum. • Protects cable sheath from abrasion when pulled in—also from wear during cable movement due to alternate expansion and contraction with changing loads. • Resists acids, alkalis, grease, oil. • Light, easy to handle and tool on the job. • Tough, resilient—will not crack or break when properly handled.

Nearly 19,000,000 More Potential Users

Since 1940, the national population has shot well beyond 150,000,000. There are now nearly 19,000,000 more people than there were ten years ago calling on industry and business to produce the goods and provide the services they demand. This, of course, greatly expands the need of electrical services. Ever-increasing amounts of the *vital fluid* must be kept flowing to industry, business, all service institutions and homes.

But only fully protected cables can transmit power unfailingly. Realizing this, more and more public utilities and municipalities are turning to Orangeburg Conduit. Why? Because the Utility Engineer knows . . . as he has known for 58 years . . . that Orangeburg provides a time-defying raceway for the permanent protection of electrical services underground.

ORANGEBURG MANUFACTURING CO., INC., ORANGEBURG, N. Y.

ORANGEBURG FIBRE CONDUIT

STANDARD Installed with Concrete

NOCRETE Installed without Concrete

GENERAL ELECTRIC SUPPLY CORPORATION

DISTRIBUTORS, ORANGEBURG FIBRE CONDUIT

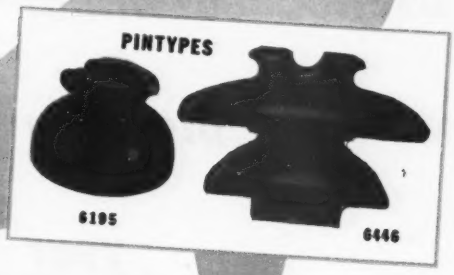
GraybaR ELECTRIC COMPANY

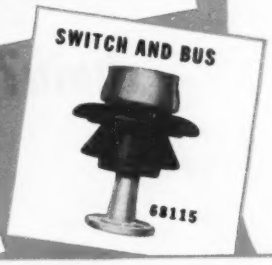
Branches and Stocks in Principal Cities

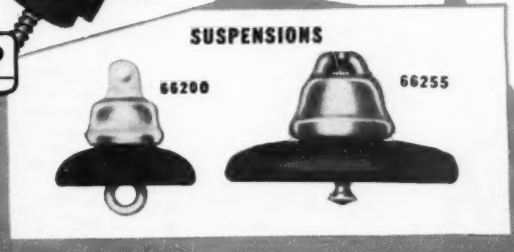
Save Time on Every Job!

Order ALL Your Insulators and Accessories from Porcelain Products Inc.

Buy all your distribution and transmission insulators and accessories from one reliable source. Round out and complete your stocks with PORCELAIN PRODUCTS' complete line of performance-tested wet process porcelain insulators, and save time on both maintenance and new construction. Ask us to send a representative to discuss your needs. Catalog and price information sent on request.







Porcelain Products, Inc.

PARKERSBURG, WEST VIRGINIA

EXPORT REPRESENTATIVE:

is

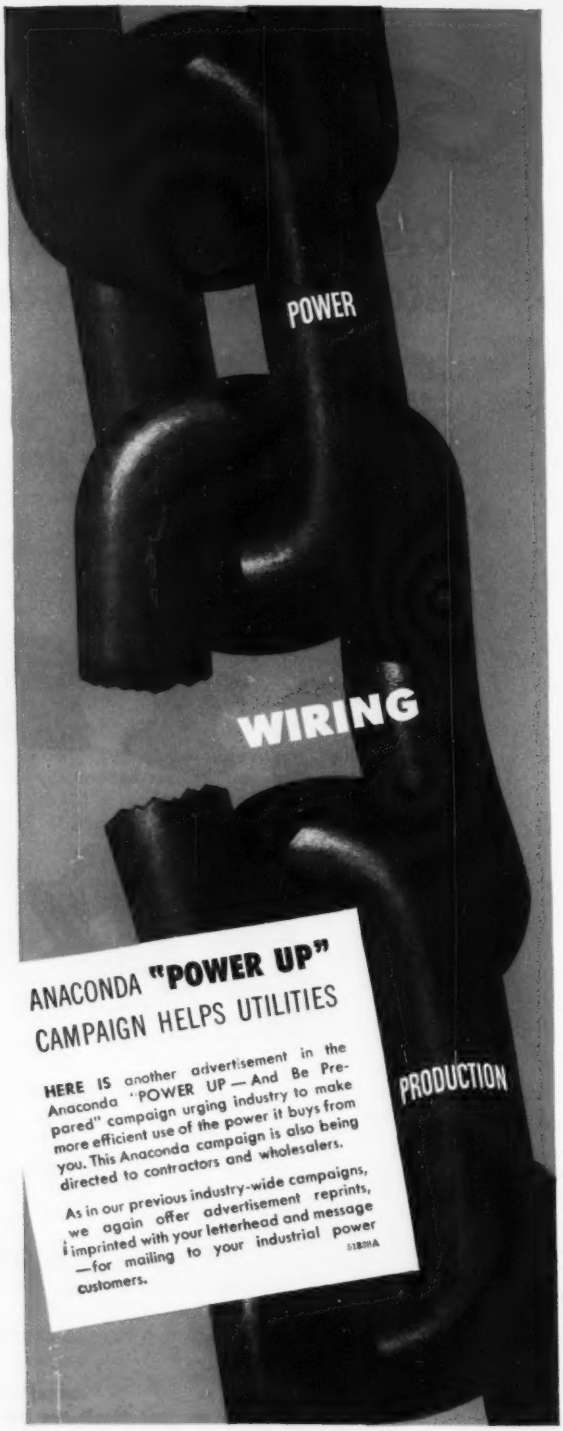
overloaded wiring

breaking

your

production

chain?



ANACONDA **"POWER UP"** CAMPAIGN HELPS UTILITIES

HERE IS another advertisement in the Anaconda "POWER UP — And Be Prepared" campaign urging industry to make more efficient use of the power it buys from you. This Anaconda campaign is also being directed to contractors and wholesalers.

As in our previous industry-wide campaigns, we again offer advertisement reprints, imprinted with your letterhead and message —for mailing to your industrial power customers.

51B28A

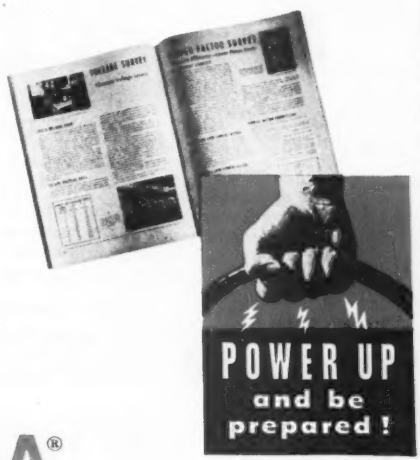
Your plant wiring may be the weak link in your production chain.

When the voltage drops at your machines, those machines slow down—and so does their production! This is happening in 9 out of 10 industrial plants—all because they're equipped with obsolete, inadequate wiring systems.

You're paying for power – make sure you make full use of what you pay for. A *modern* plant wiring system delivers to the machine the power you pay for at the meter . . . and guards you against costly power loss.

Today more than ever full-scale production is vitally important to our national defense. Strong national defense requires full production . . . and full production requires an adequate wiring system. Call your plant, utility or consulting engineer or your electrical contractor today and make arrangements to have him survey your wiring system.

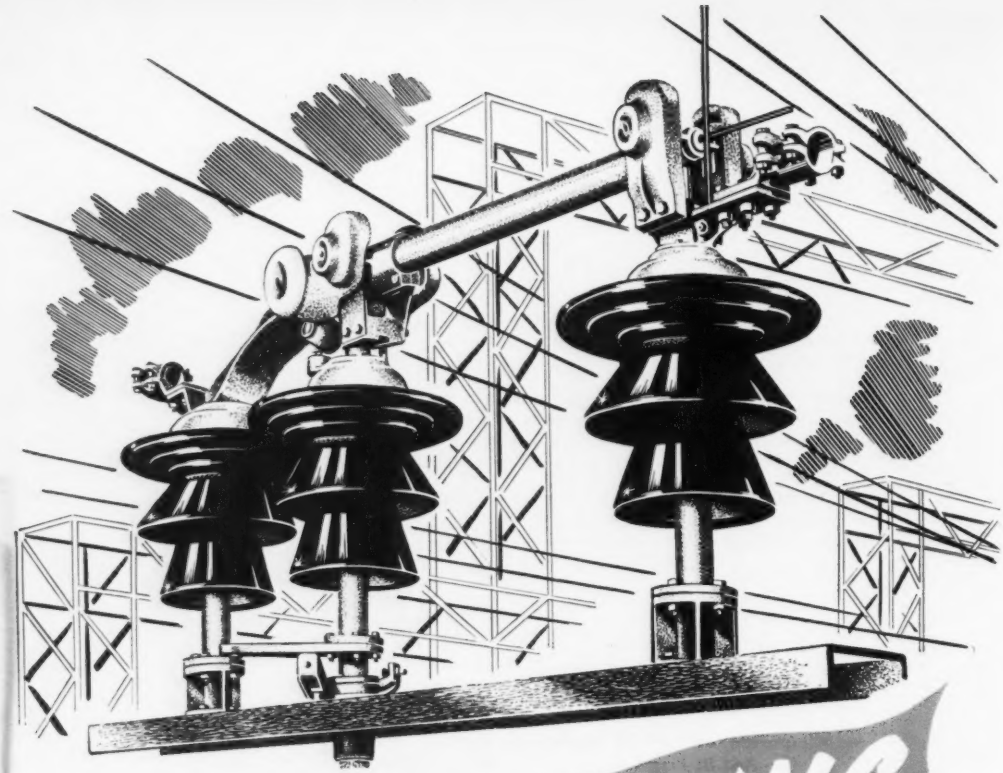
Most important of all, send for your free copy of *"Power Up—And Be Prepared."* This complete modern wiring guide shows you how you can determine quickly and easily the exact condition of your plant wiring system. Anaconda Wire & Cable Company, 25 Broadway, New York 4, New York.



the right cable for the job

ANACONDA®

WIRE AND CABLE



OUTSTANDING

where quality is important, because . . .

. . . The Type WAG will maintain adequate electrical capacity year in and year out, and withstand fault currents without damage.

. . . The Type WAG is constructed with simple mechanical linkage incorporating ice breaking leverages to insure dependable operation under the most adverse conditions.

. . . The Type WAG is easily installed and adjusted.

. . . The Type WAG requires a minimum of field maintenance.

The outstanding performance of the Type WAG in installations in every section of the United States demonstrates the soundness of its design and the high quality of its manufacture.

THE TYPE wag*

*Available in all standard NEMA ratings from 7.5 kv to 230 kv, and in current ratings from 400 amp to 6000 amp.

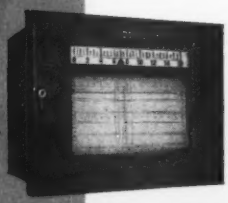
Southern States Equipment Corp.

HAMPTON GEORGIA

CHECK THE FEATURES OF
ELECTRONIK POTENTIOMETERS
THAT MEAN MOST TO YOU . . .

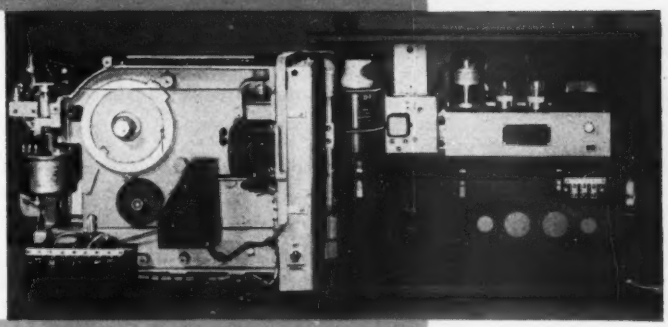
SIMPLICITY
ACCURACY
DEPENDABILITY
RUGGEDNESS
FLEXIBILITY

UTILIZE THE RUGGEDNESS OF *ElectroniK* POTENTIOMETERS



Check These
RUGGEDNESS FEATURES

- √ *Unaffected by vibration*
- √ *Dust and moisture resistant*
- √ *Can be mounted in any position*
- √ *Slide wire is totally enclosed*
- √ *Chassis is rigid, and hinged for full opening*



THE rugged construction of *ElectroniK* Potentiometers makes them ideal for the continuous and long-lasting demands of central station operation. Their resistance to wear and consistent service under varying conditions stems from a simplification that has reduced the number of basic components to only four . . . a converter, an input transformer, a voltage and power amplifier and a balancing motor.

This construction ruggedness . . . coupled with design *simplicity*, performance *dependability*, operation *accuracy*, and application *flexibility* . . . tells why more and more operators are specifying *ElectroniK* Potentiometers for indicating and recording power plant variables.

Check the ruggedness features inherent in a *ElectroniK* Potentiometers . . . then call in your local Honeywell engineer for a discussion of how they can add to your operating efficiency. Write for a copy of Bulletin 90-1.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, 4568 Wayne Ave., Philadelphia 44, Pa. Offices in more than 80 principal cities of the United States, Canada and throughout the world.

MINNEAPOLIS
Honeywell
BROWN INSTRUMENTS

saving aluminum here

saving of critical materials is not solely the prerogative of the huge giants of Industry. Here is a prime example of how a small Industrial Manufacturer is helping the Central Station Industry make substantial savings of aluminum.

Each pound of Preformed Armor Rods used makes possible a potential saving of 0.7 pounds of critical aluminum. Write on your letterhead for complete details.

Many Utilities are installing transmission lines using 795,000-CM, 26 x 7 ACSR. When this conductor is installed, using ordinary accessories, there are required at each support:

1—Aluminum suspension clamp without shackle . .	8.20 lbs.
1—Set of tapered armor rods	13.7 lbs.
2—Ovoid clamps @ 0.68 lbs.	1.36 lbs.
	23.26 lbs.

But the equivalent Preformed Armor Rod installation requires only:

1—Smaller suspension clamp without shackle. . . .	6.23 lbs.
1—Set of 0.310" Preformed Aluminum Rods 100" long .	10.08 lbs.
No Ovoid clamps	.....
	16.31 lbs.

saving— 6.95 lbs.

This results in a saving of 30% of critical aluminum. Similar savings develop for all sizes of conductor. And to further reduce the total consumption of aluminum, some Utilities use Steel Preformed Armor Rods on #4 and #2 ACSR.

saving of even [more] aluminum is made possible by using Preformed Armor Rods to:

1. Repair and rebuild transmission lines.
2. Rehabilitate old conductors.
3. Increase the current-carrying capacity of existing lines.
4. Lengthen the life expectancy of present and future lines.

armor rods today assure [more] operating conductor tomorrow

means more miles of conductor . . .

Preformed Armor Rods will . . .

- **INCREASE** the current capacity of splices, conductors in clamps, dead-ends and so on, by more than 30%.
- **LENGTHEN** the life of conductors where vibration, arcing and burning take their toll.

Easily installed in three minutes . . . even by inexperienced linemen . . . Preformed Armor Rods protect conductors better and at lower cost than ordinary armor.

They are better because only PLP rods grip uniformly over the entire conductor length.

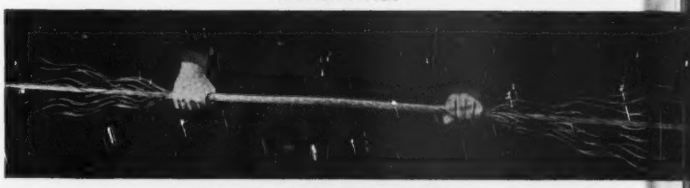
They are less expensive because your linemen make perfect installations every time, far quicker than with ordinary armor. Less expensive because only PLP rods eliminate concentrated stresses common in other forms of conductor protection.

Complete technical details and installation records are available. Just write to: *PREFORMED LINE PRODUCTS COMPANY, 5349 St. Clair Avenue, Cleveland 3, Ohio.*

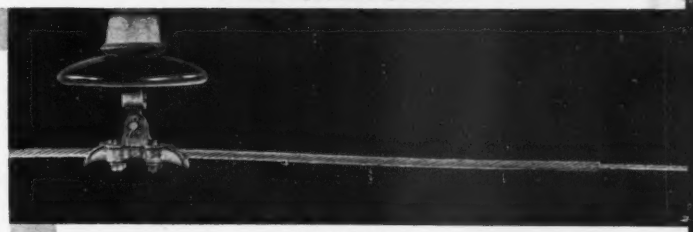
PLP ARMOR RODS ARE AVAILABLE IN ALUMINUM, COPPER, BRONZE, COPPERWELD, STAINLESS STEEL AND GALVANIZED STEEL--A TYPE FOR EVERY CONDUCTOR.

Take half to all of the rods needed and lay them across and around the conductor.

Wrap around conductor several times . . . like wringing water from a cloth. Apply remainder of rods.



Continue wiping action along conductor.



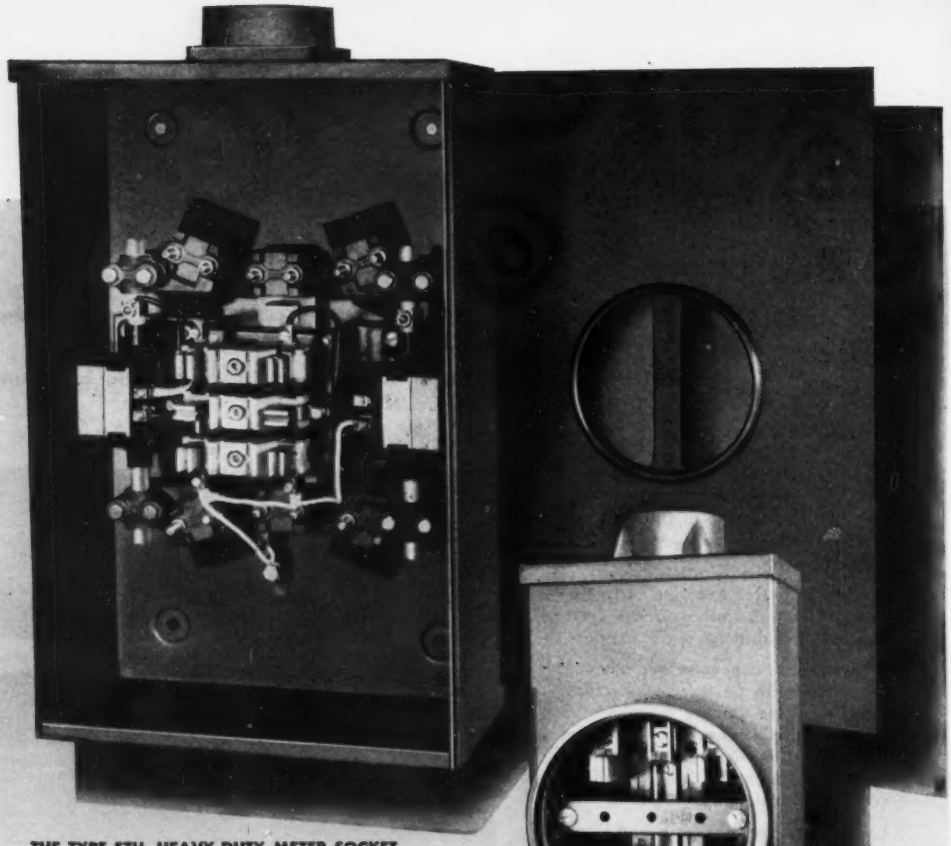
The finished job.

PREFORMED

LINE PRODUCTS CO.

CLEVELAND 3, OHIO

PREFORMED ALUMINUM ALLOY RODS ARE APPROVED BY ALL COMPANIES MANUFACTURING ACSR.



THE TYPE STU, HEAVY-DUTY METER SOCKET

- Takes standard S-type meters
- Takes up to No. 0000 cable
- Utilizes full inherent capacity of 50-amp meters
- Has removable jaws and terminal assembly
- Compact design—saves space
- Fully automatic circuit closing device

THE NEW TYPE STS TRANSOCKET

- Contains integral transformers
- Handles heavy loads—up to 400 amperes
- Cuts installation costs
- Compact design—saves space

THERE'S A WESTINGHOUSE METER FOR EVERY APPLICATION!

Single-phase watthour meter

Combination polyphase watthour and thermal demand meter

Combination single-phase watthour and thermal demand meter

Polyphase meter with block interval demand register

Two New Ways
to cut metering costs on heavy loads

Here's a pair of Westinghouse "firsts" designed specifically to cut your metering costs—the STU High Capacity Socket and the new STS Transocket, with integral transformer.

Both sockets are ideal for heavy current applications where it was formerly necessary to devise special metering facilities. They install easily . . . inexpensively . . . and take standard meters. For electric house heating, outdoor pumping installations and many large commercial loads, their cost-cutting characteristics promise important new savings. And these new units are only part of . . .

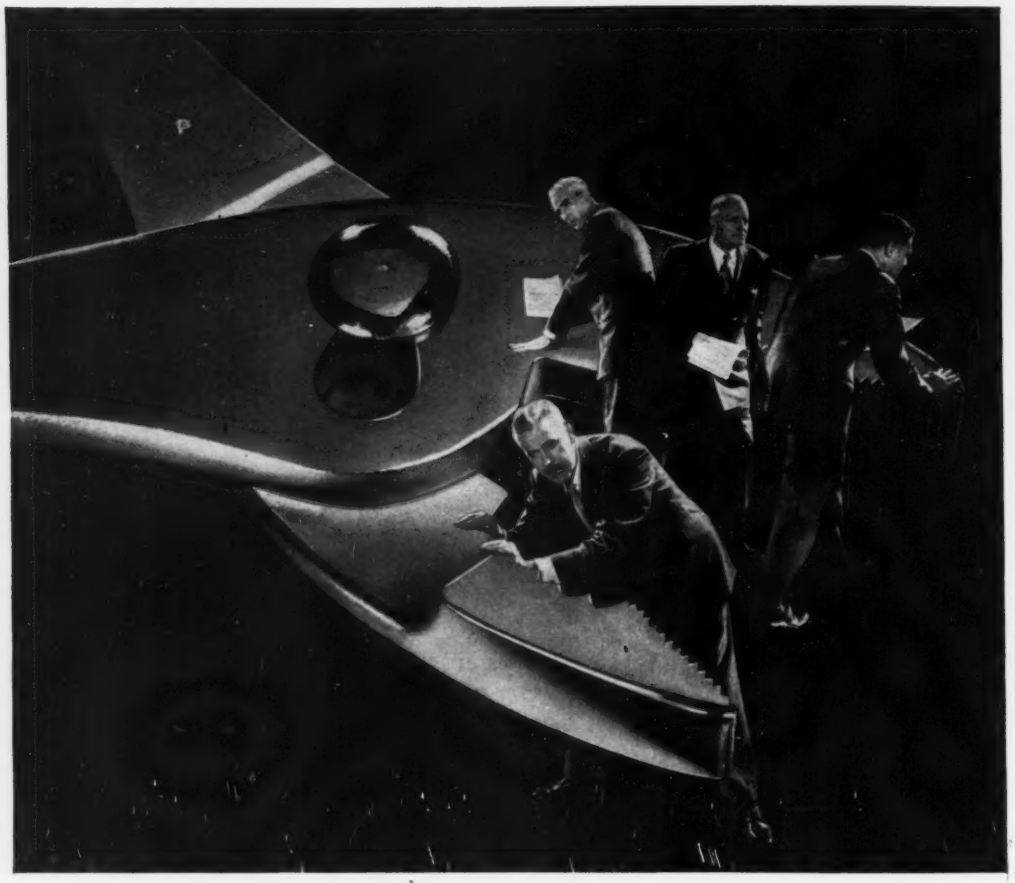
A complete line of metering equipment . . . one that meets all of your present needs . . . and anticipates many of your future requirements!

In the complete line of Westinghouse Metering Equipment you'll find many opportunities for savings. So whether your needs involve metering large loads or small, single or polyphase circuits, kw or kva, Westinghouse is a good place to go.

For complete information on High Capacity Sockets, write for Bulletin CS-42-810. Address: Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-40396

YOU CAN BE SURE.. IF IT'S
Westinghouse
METERS

how to ease the squeeze on your top executives



If predictions hold true, 1951 will be one of the biggest years ever for expansion of generating capacity in the utility industry. That means constant pressure on your company executives. More things to do. Less time to do them. That's one reason many utility companies have turned to EBASCO engineers, constructors and business consultants for outside assistance.

EBASCO has a background of wide experience in helping utility companies with problems involving rates, safety, insurance, industrial relations, sales and public relations. These are only a few. During the past half century, EBASCO has engineered and constructed projects including hydro-electric developments, steam electric and diesel plants in many parts of the world. They have installed over 8,000,000 KW of generating capacity. That's experience!

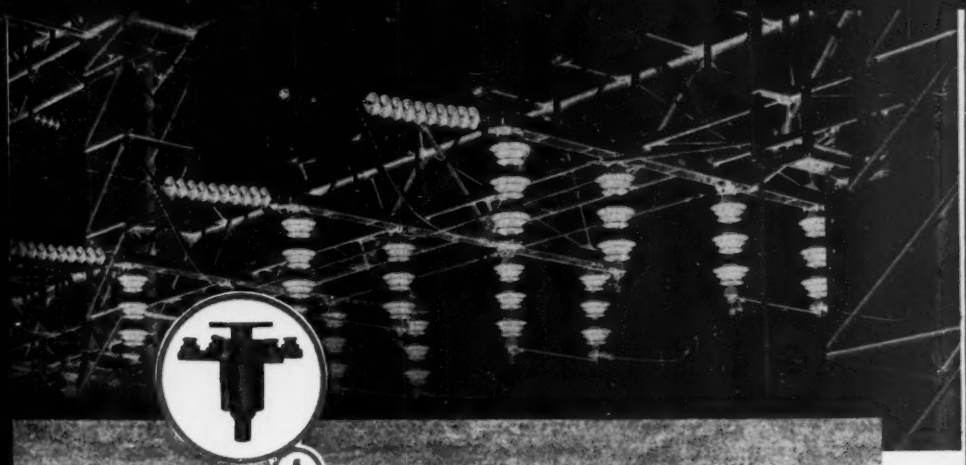
This may give you an idea of how EBASCO can help you with any problem that complicates your regular operations. We will be glad to send you "The Inside Story of Outside Help" describing the many EBASCO services available. Address Ebasco Services Incorporated, Two Rector Street, New York 6, N. Y. Dept. M.

EBASCO · ENGINEERS · CONSTRUCTORS · BUSINESS CONSULTANTS

Appraisal
Budget
Business Studies
Consulting Engineering
Design & Construction
Financial
Industrial Relations
Inspection & Expediting
Insurance & Pensions
Office Modernization
Purchasing
Rates & Pricing
Research
Sales & Marketing
Systems & Methods
Taxes
Traffic

EBASCO TEAMWORK GETS THINGS DONE ANYWHERE IN THE WORLD

EBASCO SERVICES
INCORPORATED
NEW YORK · CHICAGO · WASHINGTON, D. C.



Horizontal opening, Type TTS
115 KV., 600 Ampere.

Because you demand your switches RUGGED

CHECK the FACTS

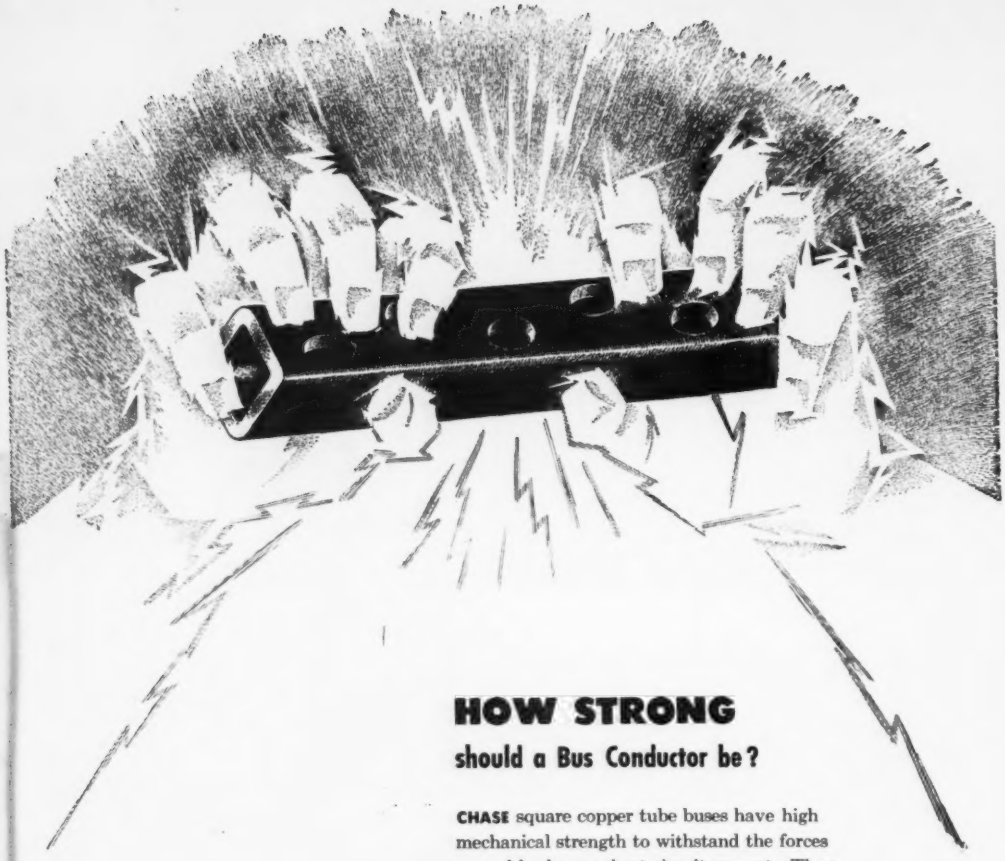
1. Hi-Pressure Contacts—efficient—dependable—self-cleaning under pressure. Proper pressure, plus a clean contact makes a dependable electrical and mechanical contact joint.
2. Blade Operating Mechanism—rotates blade after it enters jaw free of pressure—all with continuous motion.
   - A—Blade closed by insulator rotation. (see detail)
   - B—Contact made by blade rotation.
3. High Strength, high conductivity I. P. S. copper tubing blade.
4. Anti-friction, greaseless bearing for smooth easy operation. Leveling screws for proper alignment provided on all insulator stacks.
5. Clamp type, four half-inch-bolt terminal.
6. Outrigger wire guide—clamp on with out spacers.

RAILWAY and INDUSTRIAL ENGINEERING CO., Greensburg, Pa.

IN CANADA—EASTERN POWER DEVICES LIMITED, TORONTO
AN I-T-E SUBSIDIARY

The Check List

- CONDUCTOR SUPPORTS, CLAMPS AND FITTINGS
- DISCONNECTING SWITCHES INDOOR AND OUTDOOR
- HORN GAP SWITCHES
- INTERRUPTER SWITCHES
- CUTOUTS AND THERMO-RUPTERS
- DISTRIBUTION EQUIPMENT
- SWITCH OPERATING MECHANISMS
- SUBSTATIONS
- OPEN OR ENCLOSED ISOLATED PHASE HEAVY DUTY BUSES
- KIRK INTERLOCK SYSTEMS
- AUTOMATIC SWITCHING EQUIPMENT
- METAL CUBICLES
- TESTING DEVICES



HOW STRONG
should a Bus Conductor be?

CHASE square copper tube buses have high mechanical strength to withstand the forces caused by heavy short circuit currents. They have relatively large cross-sectional areas to give maximum structural strength. This permits longer spans between supports without unduly large sags.

Easily assembled and erected . . . with high thermal conductivity and low resistance voltage drop and power loss per pound of metal . . . these bus conductors are well worth your consideration. Write Dept. EW 351 for the Chase Bus Conductor Handbook.

Chase BRASS & COPPER

WATERBURY 20, CONNECTICUT • SUBSIDIARY OF KENNECOTT COPPER CORPORATION

• *The Nation's Headquarters for Brass & Copper*

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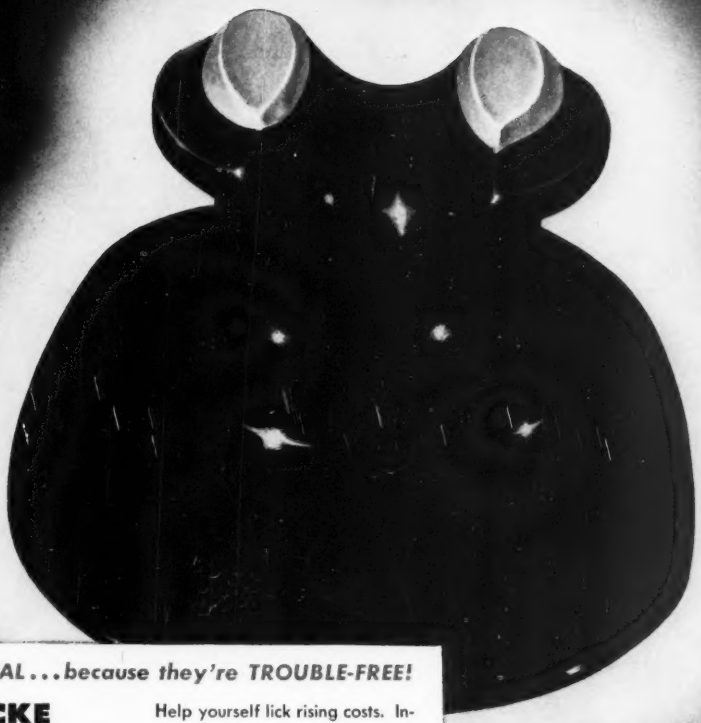
Cincinnati	Indianapolis	New Orleans	St. Louis	

LOCKE

presents masterpieces of

insulator engineering



ECONOMICAL . . . because they're TROUBLE-FREE!

LOCKE
LOW VOLTAGE
PIN TYPE
INSULATORS

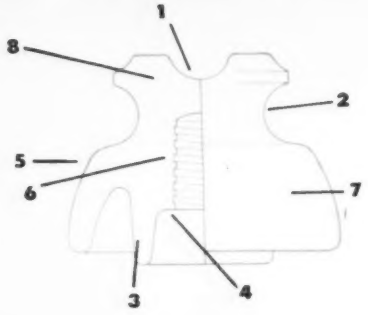
typified by

No. 9995

Help yourself lick rising costs. Install Locke Low Voltage Pin Types . . . first developed by Fred M. Locke in 1893. The millions now in active service . . . some installed as early as 1894 . . . give ample proof of their economical, trouble - free performance. Always specify them.

Presenting **A MASTERPIECE OF INSULATOR ENGINEERING**

The LOCKE *low voltage* Pin Type Insulator



LOCKE DESIGN brings you ALL these advantages

1. Smooth, deep, bell-mouthed top wire groove accommodates conductors as large as 4/0 ACSR with armor rods.

2. Deep, well-formed side wire groove provides positive support for conductors placed here for angles. Will take conductors as large as 4/0 ACSR with armor rods.

3. Deep, open corrugations develop full leakage distance and prevent bridging during rain.

4. The inner petticoat flares out quickly from pin. This assures freedom from arcing from tip of inner skirt to pin. Thus, insulator leakage distance is fully effective.

5. Uniformly smooth glazed surface means easy natural cleaning by wind and rain. It also helps insulator maintain original excellent electrical characteristics.

6. Accurately formed, glazed pin hole threads assure tight fit on pin; minimize possibility of radio interference.

7. Compression glaze . . . a Locke development . . . combined with finest grade Locke wet process porcelain assures high resistance to damage from thermal shock and mechanical impact. This also means Locke insulators can be handled faster in construction without danger of chipping or breaking.

8. On NP types the head, conductor grooves and pinhole are glazed with Locke semi-conducting Metaglaze for corona and radio noise suppression.

9. Locke Pin Type insulators conform fully to N.E.M.A. Standards.

YOU ARE EQUALLY SURE of getting a masterpiece of design when you specify other products in the complete line of Locke Insulators and suspension hardware. Each pays off in superior performance on transmission and distribution lines, generating stations, sub-station and electrical apparatus.

LOCKE
INCORPORATED
BALTIMORE • MARYLAND

LOW VOLTAGE PIN TYPE INSULATORS

HIGH VOLTAGE PIN TYPE INSULATORS

SUSPENSION INSULATORS

SWITCH & BUS INSULATORS

SPOOL INSULATORS

GUY INSULATORS

LIQUID-FILLED BUSHINGS

SUSPENSION & STRAIN CLAMPS

SUSPENSION HARDWARE

ENTRANCE BUSHINGS

Elkonite* Contacts *Offer Cost-Saving Versatility*

Many Mallory customers have been helped to better contact performance at lower cost by Mallory engineering.

A joint investigation between Mallory and a manufacturer of industrial circuit breakers revealed that, because of an improvement in the breaker, the standard Mallory Elkonite being used for an arcing tip had a higher AR** factor than required. Mallory took the initiative and developed a new grade of Elkonite that more than met the service requirements . . . and at a substantially lower cost.

That's value beyond expectation!

This incident is another demonstration of Mallory initiative and the versatility of Elkonite by which a variety of performance and cost ratios can be secured by combining the properties of the constituent metals to precisely the right degree.

Mallory contact know-how is at your disposal. What Mallory has done for others can be done for you.

In Canada, made and sold by Johnson Matthey & Mallory, Ltd., 110 Industry St., Toronto 15, Ontario

ELKONITE CONTACTS

Elkonite is the registered trade mark for a series of contact materials developed by Mallory and manufactured from metal powders. They are best known for their hardness, resistance to mechanical wear and impact, resistance to erosion by arcing (AR factor), and resistance to sticking.

Elkonite contacts are made by a unique and time-proved method which permits the combining of the desirable features of basic metals which cannot be alloyed. By this means, the high melting points of tungsten, molybdenum, or their carbides, can be combined with the current-carrying ability of silver and copper.

*Reg. U. S. Pat. Off.
**The ability of a contact material to withstand the erosion of an electric arc.

Electrical Contacts and Contact Assemblies

P. R. MALLORY & CO., Inc.

MALLORY

P. R. MALLORY & CO., Inc., INDIANAPOLIS 6, INDIANA

SERVING INDUSTRY WITH

Electromechanical Products
Resistors *Switches*
TV Tuners *Vibrators*

Electrochemical Products
Capacitors *Rectifiers*
Mercury Dry Batteries

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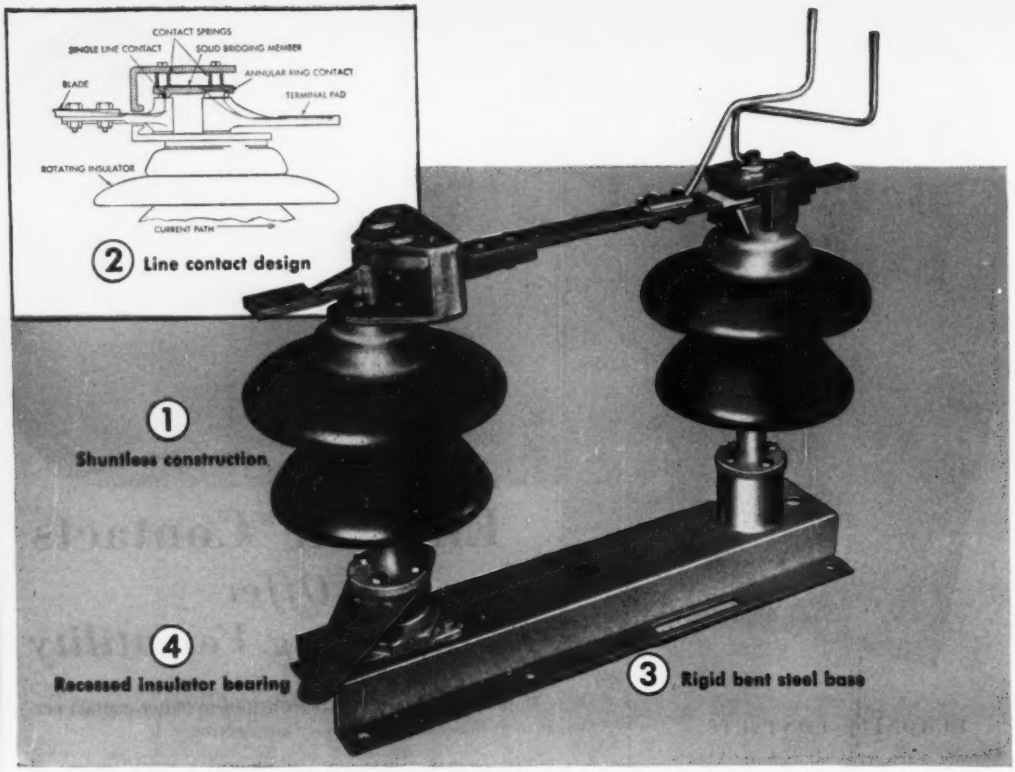
Contacts *Special Metals*
Welding Materials



Now...SHUNTLESS CONSTRUCTION

in the improved RL design!

1. Shuntless construction pioneered in the Westinghouse Type-V Switch—has now been extended to the RL design for those applications where a two insulator side-break switch is preferred. For you this means longer switch life for there's nothing to corrode or break . . . nothing to require periodic replacement.

2. Line contact design assures low-resistance path from the blade to the bridging member through a single contact . . . then to the terminal pad through an annular ring contact.

3. Bent plate steel base provides important rigidity for maintaining alignment . . . greater mounting surface . . . shorter mounting bolts.

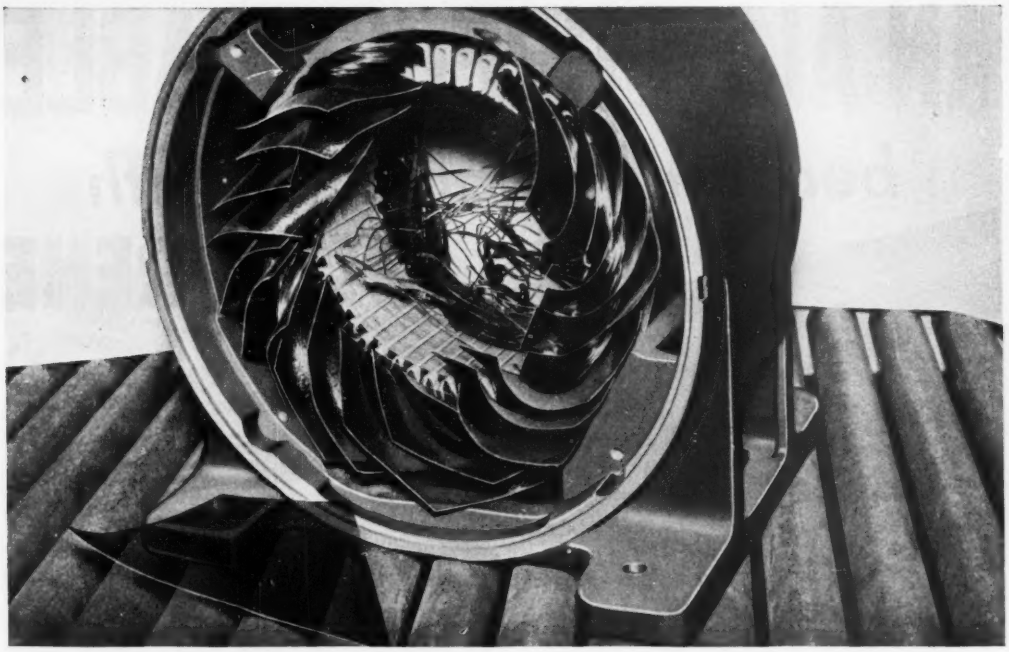
4. Recessed insulator bearing permits a flat bearing surface for faster, easier installation or storage. There's nothing to get in the way.

For complete information on all Westinghouse Disconnecting Switches, ask for Booklet B-4726. Call your Westinghouse Office or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-60750

YOU CAN BE SURE... IF IT'S

Westinghouse

DISCONNECTING SWITCHES



When insulation must stand 500° Heat ...look to IRVINGTON'S Class "H" Line

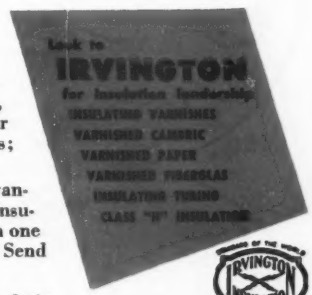
Whether you are winding for service at high ambient temperatures — for increased *continuous* power ratings — for greater *short-time* overload capacity . . .

Or *designing* for space-and-weight savings . . .

You will find the Class "H" insulation you want in the complete Irvington line.

Depending on service requirements, *your* high-temperature insulation job may call for Silicone Varnished Fiberglas*, in yard goods, tape or tubing forms; Silicone Glass Mica; Silicone Saturated or Silicone Coated Asbestos; Silicone Rubber Coated Fiberglas; Silastic**Tape, Teflon Coated Fiberglas.

We make them *all* — we're ready to help you use *each* to best advantage. Write for a free copy of our book — Irvington Class "H" Insulations — it contains samples. Perhaps you'd prefer to talk with one of our engineers. The coupon below is for your convenience. Send it today. No obligation.



*Owens-Corning Fiberglas Corp. **Dow Corning

Send this convenient coupon now

Irvington

VARNISH & INSULATOR COMPANY

6 Argyle Terrace, Irvington 11, New Jersey

Irvington Varnish & Insulator Co. EWO-3/51
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☐ Please send me a free copy of "Irvington Class 'H' Insulations".

☐ I'd like to see one of your engineers. Please have him phone or write for an appointment.

Name ..... Title .....

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Address ..... Phone .....

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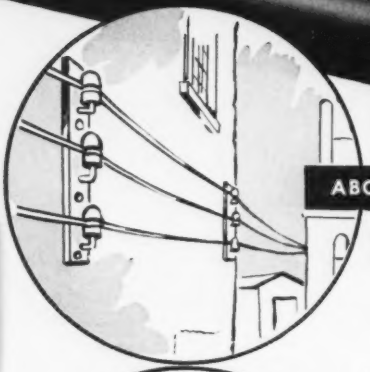
AN ALL-PURPOSE CABLE

because it's jacketed with

NEOPRENE



ABOVE GROUND

For rural, residential or industrial service

You can install neoprene-jacketed cable just about anywhere and get long, trouble-free service. Above ground, neoprene-jacketed cable outperforms other types because of its unequalled resistance to deterioration from sunlight and weathering. In heavily industrialized areas, neoprene stands up in corrosive atmospheres that quickly attack and destroy ordinary cable coverings. As a result, it is ideal for both primary and secondary power cable. Wherever used, a neoprene jacket provides lasting protection against oil, concentrated ozone and heat.

IN DUCTS

Underground, buried direct or installed in ducts, neoprene is immune to attack from soil acids. Unlike metallic coverings, it is not hurt by electrolytic action caused by stray currents. So, for underground distribution in rural or urban areas . . . airport or stadium lighting . . . service entrance use . . . police and fire alarm systems . . . neoprene-jacketed cable will meet rigid requirements.

DIRECT IN EARTH

Cable manufacturers supply neoprene-jacketed cable in single and multiple conductor types in a range of voltage ratings. Since the same cable is often suitable for different uses, lower inventories are possible. And remember, a neoprene jacket assures longer life, fewer repairs, less frequent replacement even in the most severe service.

Tune in Du Pont "Cavalcade of America" Tuesday nights — NBC coast to coast

FREE! **THE NEOPRENE NOTEBOOK**—Interesting stories . . . new, unusual applications and products of neoprene. Write E. I. du Pont de Nemours & Co. (Inc.), Rubber Chemicals Division G-3, Wilmington 98, Delaware.

NEOPRENE

The rubber made by Du Pont since 1932

DU PONT

REG. U.S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

SQUARE D *Reduced Voltage* STARTERS

One of these 4 types will meet your requirements . . . best

Is minimum motor current inrush your primary consideration?
Is it reduced starting torque? Or maximum smoothness in acceleration?
Is cost an important factor?

With these four types Square D can meet any reduced voltage starter requirement—exactly.

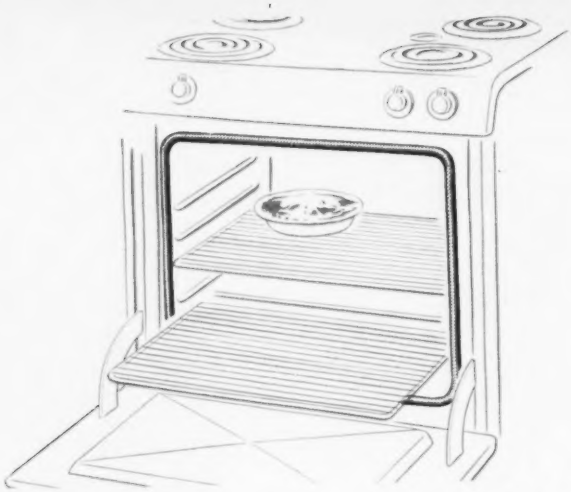
Write **for Reduced Voltage Starter Bulletins. They give complete details.**
Address Square D Company, 4041 N. Richards Street, Milwaukee 12, Wisconsin.

ASK YOUR ELECTRICAL DISTRIBUTOR FOR SQUARE D PRODUCTS

SQUARE D COMPANY

DETROIT • MILWAUKEE • LOS ANGELES

SQUARE D COMPANY CANADA LTD., TORONTO • SQUARE D de MEXICO, S.A., MEXICO CITY, D.F.



The heat is "sealed in" when this door closes

See how the door of this electric oven closes on a strip of BH "750" Fiberglas Sleeving . . . closes and seals in the heat.

BH "750" is braided Fiberglas, tubular in shape, 3/8" inside diameter, with these properties:

(1) Oven heat won't impair it—no baking out or drying out even when subjected to prolonged high temperatures, nothing to melt or fuse.

(2) Easy to work with—speeds assembly because of its remarkable flexibility. Non-fraying—without use of hardening varnish or lacquer.

(3) Abrasion resistant—durability proved in service, no splitting or cracking under mechanical vibration.

BH "750" has merchandising possibilities, too. The oven door, illustrated, has the quiet closing of a Cadillac door—the tubular braid is "springy" in action, no porcelain-to-porcelain contact. Roasts do not dry out because moisture is sealed in the oven. Reduces staining of porcelain surfaces by minimizing leakage of heat or vapors from the oven.

BH "750" is a branch of the BH Insulation Family. There are many others. Whether you are interested in heat-resistant properties, dielectric properties, or a combination of both, BH Fiberglas Sleevings may be the answer to your problem. Write us today.

BENTLEY, HARRIS MFG. CO., CONSHOHOCKEN, PA.

BH *Fiberglas** SLEEVINGS

*BH Non-Fraying Fiberglas Sleevings are made by an exclusive Bentley, Harris process (U. S. Pat. No. 2393530). "Fiberglas" is Reg. TM of Owens-Corning Fiberglas Corp.

USE COUPON NOW

Bentley, Harris Mfg. Co., Dept. W-44, Conshohocken, Pa.

I am interested in BH "750" Fiberglas Sleeving. Send samples for production testing.

My heat sealing problem is _____

_____

NAME _____ COMPANY _____

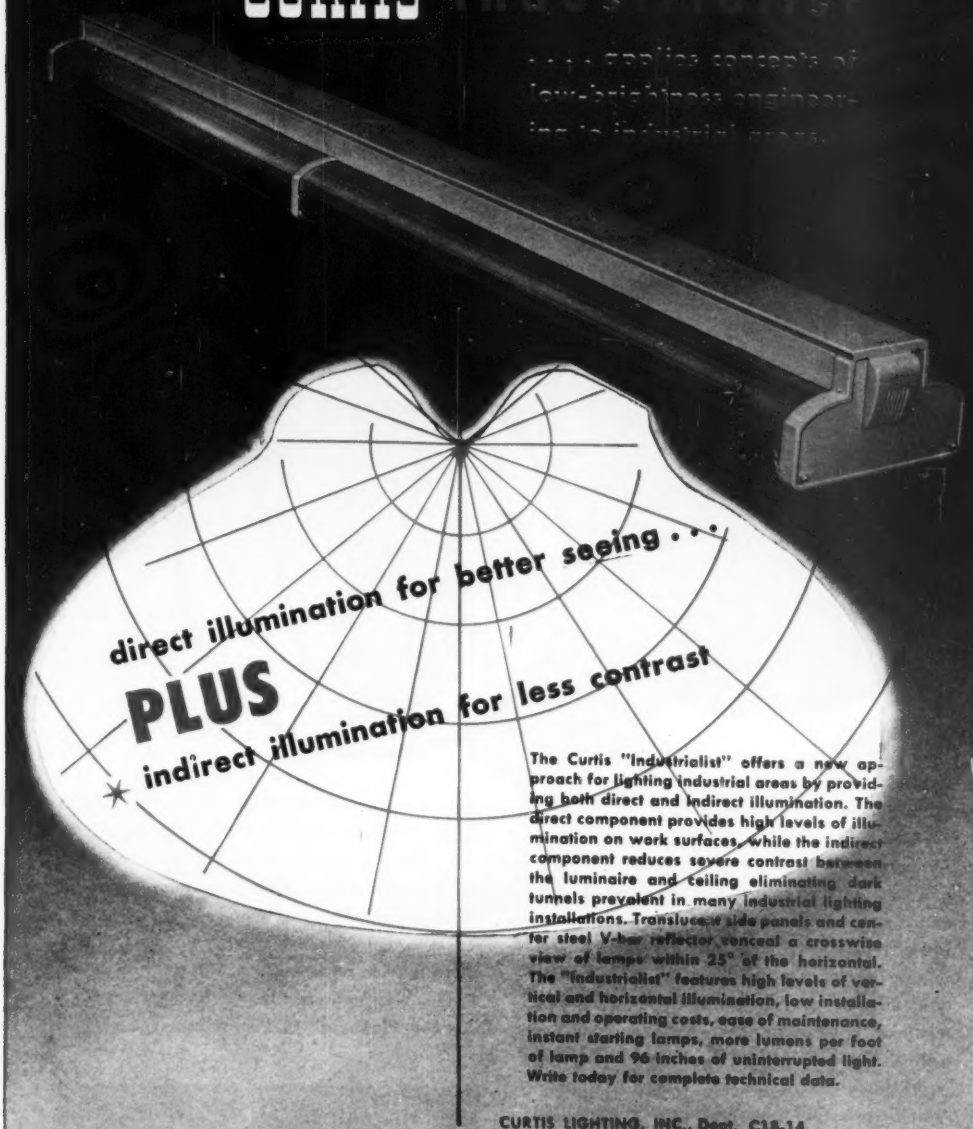
ADDRESS _____

Send sample and price on BH Electrical Insulating Sleevings:

- ☐ BH 649 Fiberglas Tubing, Grade A-1
- ☐ BH 649 Fiberglas Tubing, Grade B-1
- ☐ BH 649 Fiberglas Sleeving, Grade C-1
- ☐ BH Extra Flexible Fiberglas Sleeving
- ☐ BH Special Treated Fiberglas Sleeving

CURTIS industrialist

. . . applies concepts of low-brightness engineering to industrial areas.



direct illumination for better seeing . . .

PLUS

indirect illumination for less contrast

The Curtis "Industrialist" offers a new approach for lighting industrial areas by providing both direct and indirect illumination. The direct component provides high levels of illumination on work surfaces, while the indirect component reduces severe contrast between the luminaire and ceiling eliminating dark tunnels prevalent in many industrial lighting installations. Translucent side panels and center steel V-bar reflector conceal a crosswise view of lamps within 25° of the horizontal. The "Industrialist" features high levels of vertical and horizontal illumination, low installation and operating costs, ease of maintenance, instant starting lamps, more lumens per foot of lamp and 96 inches of uninterrupted light. Write today for complete technical data.

CURTIS LIGHTING, INC., Dept. C18-14
6135 W. 65th St., Chicago 38, Illinois

NAME _____

COMPANY _____

ADDRESS _____

CITY _____ STATE _____

CURTIS
LIGHTING, INC.
6135 WEST 65th STREET CHICAGO 38, ILLINOIS

Another Cut in Cost—

of voltage regulation for rural loads

Testing and servicing are made easy by control cabinet with door hinged at bottom to form a "workbench"—and by easily removable flexitest drawout-type relay chassis.

New dollar-saving advantages have been added to the URL-8 Feeder Voltage Regulator. *Testing and servicing are now made easier, faster.*

A new package control permits removal of the entire assembly as a unit—in the field—for testing or repair. Or a stand-by unit can be inserted in a matter of seconds. Mounted in a drawout-type flexitest case, it facilitates quick testing, repair or replacement. Also, the door of the control cabinet is hinged at the bottom, to form a "workbench" during inspection and servicing.

Single-pole mounting, made possible by lightweight construction, results in lower installation costs. Simple, direct drive tap changer cuts maintenance. The characteristics of the voltage-regulating relay assure close regulation. Separate resistance and reactance line drop compensation is adjustable by individual dials.

Get complete information from your nearby Westinghouse representative, or write for Catalog 47-430. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-70586

YOU CAN BE SURE.. IF IT'S

Westinghouse

VOLTAGE REGULATORS

FITS THE HAND
FITS THE WORK
FITS THE BELT

This tag says
"PRETESTED"
It guarantees that each individual tool tested 100% satisfactorily before it left the factory.

● Here's one of the finest tools ever to bear the Crescent name. It's an improved, easier-to-use CRESTOLOY Round Nose Lineman's Pliers... streamlined for better handling, better work and easier carrying in the belt. Forged from special "Crestoloy" steel, it's two ounces lighter, yet just as strong as the heavier conventional model. Its cutting edges are carefully hand-honed to provide lasting sharpness. The milled teeth in the nose assure a non-slip grip on wire or other work. The handles fit the hand "like a glove."

No. 2150
Crestoloy 8" Lineman's Pliers. Available also with insulated handles.

CRESCENT TOOL COMPANY, JAMESTOWN, N. Y.

"Crescent" is our trade-mark, registered in the United States and abroad, for wrenches and other tools. Sold by leading distributors and retailers everywhere and made only by Crescent Tool Company, Jamestown, N. Y.

CRESCENT TOOLS
Give Wings to Work

Sign of the Artisan
Symbol of Excellence

Shooting for low-cost installation?

Secondary feeders for softball field lights—7,000 ft. of 300,000 cm aluminum cable, neolay insulated, buried direct. Voltage drop held to less than 2% on 220/110-volt circuits. (Runs up to 375 ft.)

figure it in aluminum

You can't miss seeing the saving when you figure wiring in aluminum. For distribution lines, power and feeder cable, for industrial wiring—insulated aluminum electrical conductors cost less to buy, less to install. The bigger the cable, the greater your saving. For names of manufacturers, call your nearby Alcoa sales office (look under "aluminum" in your classified telephone directory). ALUMINUM COMPANY OF AMERICA, 1776C Gulf Bldg., Pittsburgh 19, Pennsylvania.

• • •

Although the rearmament program prevents unrestricted sale of aluminum, we are ready to help you with the planning required for electrical wiring projects. Get the facts! Write for "Questions & Answers About Aluminum Conductors and Installations".

Insulated **Aluminum Conductors**

ALCOA

of ALCOA EC ALUMINUM are made by leading manufacturers

High Insulation Strength

NEW ALLIS-CHALMERS
POTENTIAL TRANSFORMERS

★ Corona-Free Design
★ High Thermal Capacity
★ Hermetically Sealed Tank

Type SPW transformers for line-to-line or line-to-ground operations are available in all standard ratings. The transformers shown have standard insulation class ratings of 69 kv.

FOR HEAVY DUTY and accurate metering, the new Type SPW outdoor potential transformer will perform to your highest expectations. Severe insulation tests prove the SPW has excellent impulse characteristics and high 60 cycle dielectric strength. Yet it is light weight, small and compact as the table below shows.

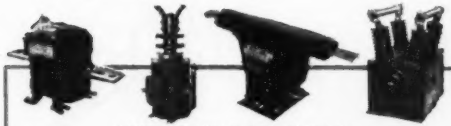
Corona-free design, applied to the vacuum dried insulation, protects the coil—another step toward longer transformer life. The tank is all-welded and hermetically sealed to protect insulation and oil from sludge formation. The unique SPW bushing construction—with oil common to both the bushing and transformer tank—has reduced transformer size and oil requirements.

Contact your nearby A-C district office for details on any of the wide range of Allis-Chalmers instrument or metering transformers. Or write Allis-Chalmers, Milwaukee 1, Wisconsin for bulletin 61B7168 listing over 400 types and ratings.

A-3271

DATA FOR TWO BUSHING TRANSFORMER

Rating	Impulse Strength kv	Output at 55°C Rise	Base Dimension	Height	Net Weight
SPW-2 24 kv	150	3½ kva	14½ x 14⅝	36½	252
SPW-3 34.5 kv	200	4 kva	15½ x 16⅝	39	310
SPW-4 46 kv	250	4 kva	19 x 19	49	615
SPW-6 69 kv	350	6 kva	25½ x 24	61	1050



OVER 400 TYPES AND RATINGS

INDOOR CURRENT transformer for low voltage metering. Type KLW 600 v.

OUTDOOR CURRENT transformer. For heavy duty metering. Type KO to 15 kv.

INDOOR CURRENT transformer. For heavy duty metering. Type K3E to 15 kv.

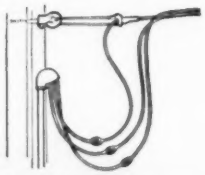
INDOOR POTENTIAL transformer. Type PD, fused or unfused, 200 va up to 14,400 volts.

A-C ALLIS-CHALMERS

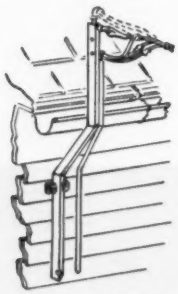
ALLIS-CHALMERS

When Rome Self-supporting Service Cable goes up... your costs go down!

Insulated with RoPrene (Neoprene) or RoLene (Polyethylene)

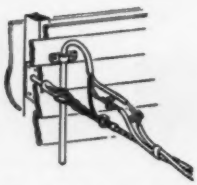


Typical Dead-end Arrangement



Typical Attachment to Service Riser

Typical Service Connection



Typical Built-in Attachment

Small wonder more and more electric utilities are specifying Rome Self-Supporting Secondary and Service Drop Cable. Its simplicity of construction, its lower cost (up to 25 per cent), compared with conventional Service Drop (Type SD) Cable, will save you money.

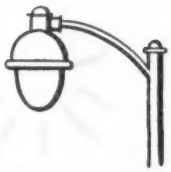
HERE'S WHY...

- Ease and economy of installation with less labor and cheaper hardware
- Eliminates crossarms and permits shorter poles
- Longer life in all weather because of its all-resistant Neoprene or polyethylene insulation . . . no braids to rot or festoon
- Less tree triming because of its high resistance to abrasion
- Conductor accessibility with no common covering to remove
- Less subject to damage by storm and falling limbs . . . will operate SAFELY even if down
- Better voltage regulation because of lower reactance in long and heavily loaded circuits

A product of Rome Cable engineering, Rome Self-Supporting Secondary and Service Drop Cable is today's answer to high service installation costs. Its advantages have been service proven by leading utilities. Send for Bulletin RS-4 and see for yourself why it is the accepted cable for economical overhead services.

IT COSTS LESS TO BUY THE BEST

Rated at 600 volts with maximum continuous copper temperature of 80° C.



STREET LIGHTING CABLES

RoZone-RoPrene Series Street Lighting—5,000 Volts

RoLene-Rome Synthinol* Series Street Lighting—5,000 Volts

RoLene Ornamental Pole and Bracket Cable—4,000 to 12,000 Open Circuit Voltage

* TRADE MARK REG.

Rome manufactures a wide range of high and low voltage cables for underground or overhead wiring or series and multiple lighting systems.

- RoZone-RoPrene (Neoprene) offers the ultimate in non-metallic sheathed series street lighting cables suitable for direct burial or duct installation.
- RoLene (Polyethylene) insulated types are a new development and offer considerable economic advantages.
- RoLene (Polyethylene) Belted Ornamental Pole and Bracket (Mast Arm) Cable is an up-to-date design featuring improved construction with small diameter and low cost.

ROME CABLE CORPORATION, Dept. EW-3, Rome, N. Y.
Please send me Bulletin RS-4

Name ..... *Title* .....

Company .....

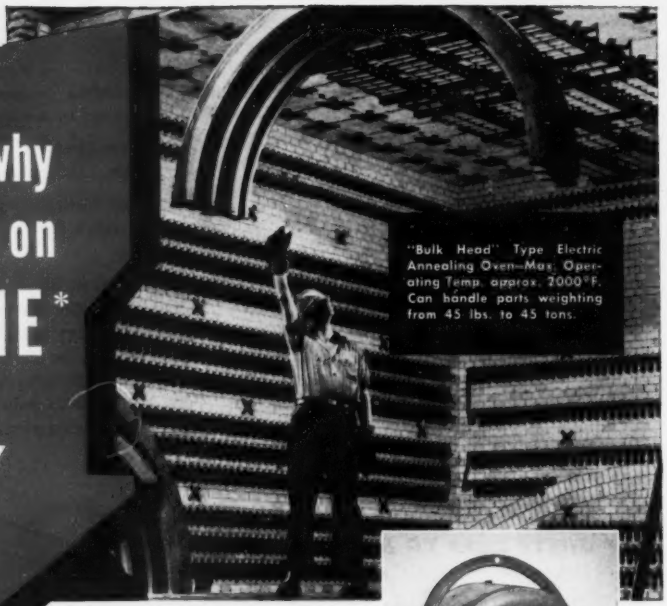
Street .....

City ..... *Zone* ..... *State* .....

ROME CABLE
Corporation
ROME · NEW YORK
From Bar to Finished Wire

ROME CABLE ROME, N.Y.

5 reasons why you can rely on NICHROME* in your electrically heated products



"Bulk Head" Type Electric Annealing Oven—Max. Operating Temp. approx. 2000°F. Can handle parts weighting from 45 lbs. to 45 tons.

(Photographs courtesy of General Electric Company)

Forced-Convection Type Unit Air Heater.

Edgewise-wound resistor—typical of large industrial applications.

Waffle Iron and Sandwich Grill —one of many G.E. appliances.

1. Nichrome alloys, meticulously developed over a period of 40 years, meet the need for resistor materials that can perform with exceptional suitability at high temperatures. Their high resistivity and resistance to oxidation at high temperatures dictate their choice for heating elements in a host of different products.

2. Nichrome and Nichrome V are *custom built*—produced to rigid specifications determined by conditions of application and in-use factors. Consequently, *absolute uniformity* is assured from order to order.

3. Nichrome and Nichrome V undergo only negligible changes even when required to meet unusually exacting service demands. Thus delivery of full-rated power is assured thruout a long life of trouble-free operation.

4. Nichrome and Nichrome V afford flexibility of choice, permitting heating elements to be designed economically, with close regard to service requirements. For example: Nichrome is ideal for heating devices, such as cord-connected domestic appliances, operating up to 1700°F.; Nichrome V for electric furnaces, ovens, etc., operating at temperatures in excess of 1700°.

5. Nichrome and Nichrome V are available in different forms—wire, ribbon, strip, sheet and rod. Such variety offers outstanding aid to designer, engineer, and manufacturer.

The different examples of products shown here indicate the wide range of application for Nichrome and Nichrome V. For improved performance and longer life in *your* products, remember these peerless Driver-Harris electrical alloys and consult with us. Although the present emergency is making unprecedented demands upon the resources of the Driver-Harris Company, we shall be glad to make recommendations based upon your specific needs, and serve you to the best of our ability.

Nichrome and Nichrome V are manufactured only by

Driver-Harris Company

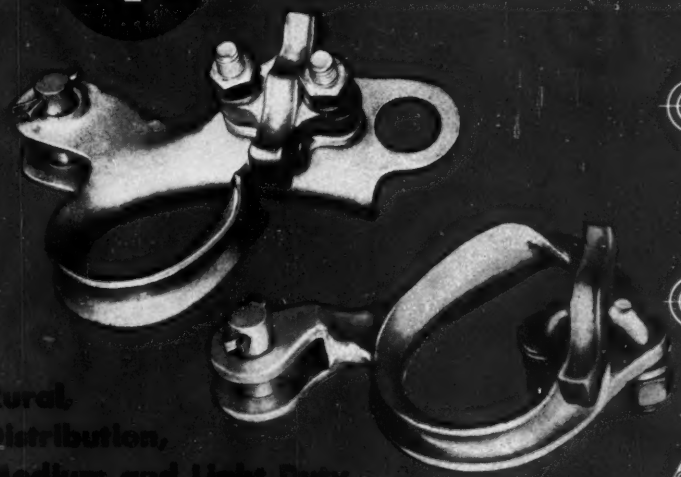
HARRISON, NEW JERSEY

BRANCHES: Chicago, Detroit, Cleveland, Los Angeles, San Francisco

Manufactured and sold in Canada by The B. GREENING WIRE COMPANY, LTD., Hamilton, Ontario, Canada

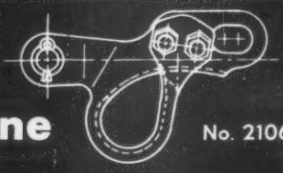
*T.M. REG. U. S. PAT. OFF.

BTC ... the COMPLETE line



Rural, Distribution, Medium and Light Duty

TRANSMISSION LINE STRAIN CLAMPS



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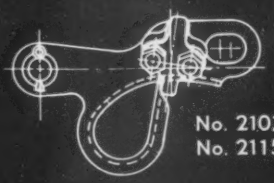

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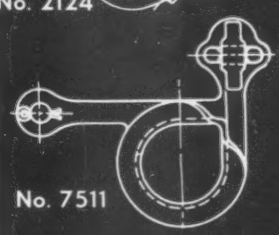

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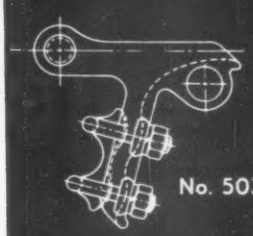


No. 5030

Pressed and Drop Forged Steel Strain Clamps that offer an efficient and economical method of dead-ending conductors on Rural, Distribution and Medium or Light Duty Transmission Lines play an important role in BTC's **complete line** of transmission line hardware.

These clamps are, for the most part, the familiar "Snail Shell" type clamp, many millions of which are in satisfactory field service. Their snubbing action — without conductor-crushing clamping pressure — develops excellent holding power. And each clamp will break, without slip, any conductor for which it is offered. Ultimate strengths are more than adequate.

REDUCE VIBRATION DAMAGE. The designs of these BTC clamps minimize the factors causing conductor vibration damage and failure. The light weight of the steel parts, together with the short distance between the center of mass and the center of oscillation at the connecting pin, effects a low moment of inertia. Result: little resistance to the free passage of vibration waves; a minimum of local bending of the conductor at the clamp mouth. The large clamp-mouth-seat-radius prevents severe concentration of bending and tension stresses at conductor-entrance point, while the smooth, die-formed conductor seats and amply-long clamping sections prevent surface damage and crushing of the conductor.

EASY TO APPLY. These clamps are easy and economical to apply or work hot. Provision is made for the use of come-along tackle by the loop on the Pressed Steel Series and the open center on the Drop Forged Steel Series. Drop Forged Series are side-opening type. The jumper need not be cut and connectors may be eliminated on a large share of dead-ending positions.

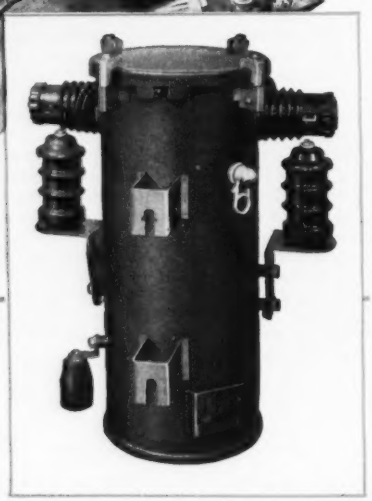
For full details, write Brewer-Titchener giving complete specifications. And, if you have not yet received a copy, ask for BTC's new "Hi-Line Hardware Catalog."

Sold only through your insulator manufacturer

THE BREWER-TITCHENER CORPORATION, Cortland, N. Y.

YOU CAN BE **SURE**.. IF IT'S

Westinghouse



A new line of "CSP" Transformers, with wall-mounted, high-voltage bushings and "De-ion®" arresters. Easier to install, with improved pole clearance. New, extra-strength bushings have large unbreakable "Enrup®" knobs for fast, positive hand-tightening of leads. Convenient location of arresters and brackets facilitates adaptation to wye or delta systems.

*TM Reg. U. S. Rubber Co.

Eliminates 80%

of your service calls

Here's how a large midwest utility credits "CSP®" (Completely Self-Protecting) Transformers with greater savings . . . better personnel relations, too, because they alleviated a costly problem:

> "No one liked the necessity of calling out a full crew in the middle of the night to restore service on a conventional transformer because of a simple fuse outage. *'Midnight Nuisance'* is the term we applied. Our linemen used even stronger language.
>
> "Now, 'CSP' Transformers give ample warning of overload conditions. The Emergency Control provides reserve capacity to forestall outages until change-outs are convenient. Since we've standardized on 'CSP' Transformers, we've practically eliminated the *'Midnight Nuisance'*.
>
> "Our line crews prefer their greater freedom from emergency calls . . . and our comptroller appreciates the savings!"

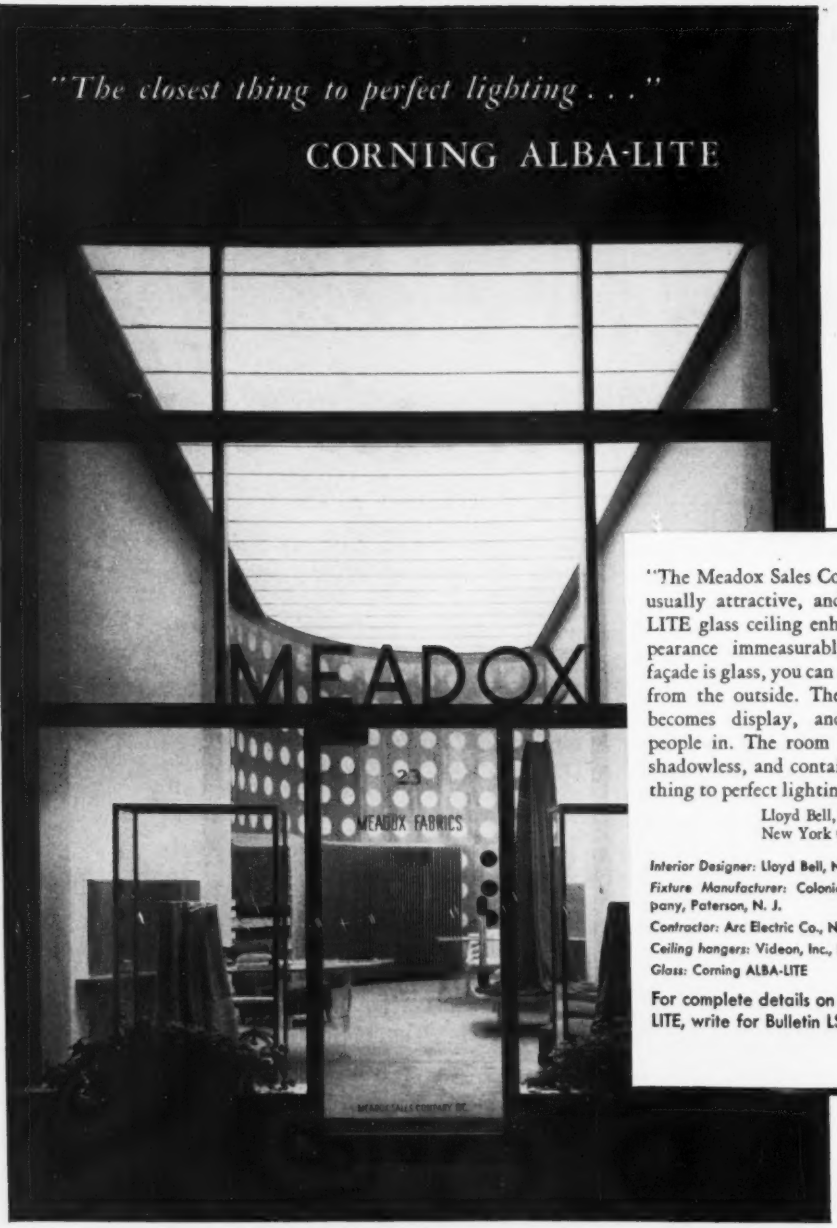
One sure fact stands out: "CSP" Transformers cut service costs

Get the full story on how Westinghouse "CSP" Transformers, with built-in lightning and thermal protection, can cut distribution costs for you. Ask your Westinghouse representative for a copy of booklet B-4249-A, or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh, 30, Penna.

J-70568

"The closest thing to perfect lighting . . ."

CORNING ALBA-LITE



"The Meadox Sales Company is unusually attractive, and the ALBA-LITE glass ceiling enhances the appearance immeasurably. Since the façade is glass, you can see the ceiling from the outside. The entire room becomes display, and draws the people in. The room is completely shadowless, and contains the closest thing to perfect lighting I know of."

Lloyd Bell, *Interior Designer*
New York City

Interior Designer: Lloyd Bell, New York City
Fixture Manufacturer: Colonial Electrical Company, Paterson, N. J.
Contractor: Arc Electric Co., New York City
Ceiling hangers: Videon, Inc., East Orange, N. J.
Glass: Corning ALBA-LITE

For complete details on Corning ALBA-LITE, write for Bulletin LS-29 today.

CORNING GLASS WORKS, CORNING, N. Y.

1851 • 100 years of making glass better and more useful • 1951

Corning means research in Glass

PYREX

CORNELL-DUBILIER CAPACITORS

FOR POWER-FACTOR IMPROVEMENT

Another C-D Capacitor Field Service Record:

99.77% TROUBLE-FREE SERVICE FOR LARGE MIDWESTERN UTILITY

for large Midwestern Utility

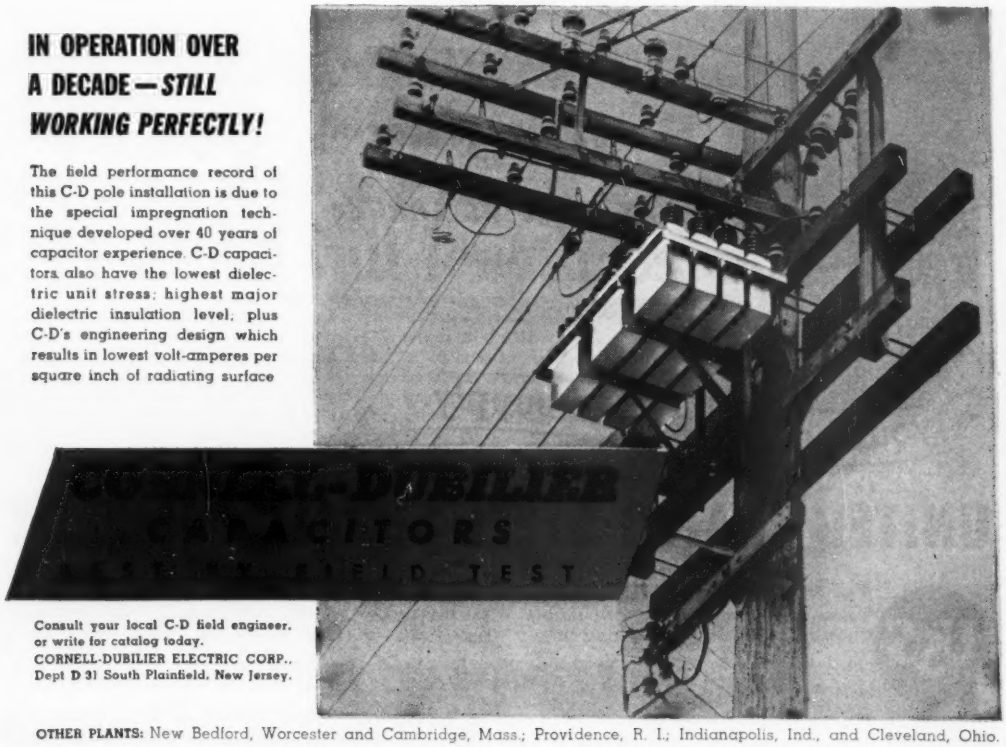
A large midwestern utility, serving a densley populated and highly concentrated industrial area, has, over the past decade, added to its system over 50,000 Kvar of C-D Pole-Type Capacitors. This utility reports that these capacitors have a field performance record of 99.77% trouble-free service.

FOR CONSISTENTLY DEPENDABLE PERFORMANCE—*specify CORNELL-DUBILIER*

the product of years of specialized experience in the power-factor field

IN OPERATION OVER A DECADE—*STILL WORKING PERFECTLY!*

The field performance record of this C-D pole installation is due to the special impregnation technique developed over 40 years of capacitor experience. C-D capacitors also have the lowest dielectric unit stress; highest major dielectric insulation level; plus C-D's engineering design which results in lowest volt-amperes per square inch of radiating surface



Consult your local C-D field engineer, or write for catalog today.
CORNELL-DUBILIER ELECTRIC CORP., Dept D 31 South Plainfield, New Jersey.

OTHER PLANTS: New Bedford, Worcester and Cambridge, Mass.; Providence, R. I.; Indianapolis, Ind., and Cleveland, Ohio.

"WHO'D BE WILLING TO BOTHER WITH SUCH A SMALL STEEL ORDER?"

"U. S. STEEL SUPPLY! THEY'VE ALWAYS BEEN INTERESTED IN SMALL BUYERS AS WELL AS LARGE."

...your best source of supply...

UNITED STATES STEEL SUPPLY COMPANY

Warehouses and Sales Offices: BALTIMORE • BOSTON • CHICAGO • CLEVELAND • LOS ANGELES • MILWAUKEE • MOLINE, ILL. NEWARK • PITTSBURGH • PORTLAND, ORE • SAN FRANCISCO • SEATTLE • ST. LOUIS • TWIN CITY (ST. PAUL)
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UNITED STATES STEEL

The Perfect Combination . . .

WESTERN RED CEDAR POLES

LIFE-SPAN full length Immunization

Here truly is an unbeatable combination . . . Nature's most perfect poles treated the LIFE-SPAN way. Every Western Red Cedar Pole receives complete end-to-end treatment, first in a hot solution to drive out the air and prepare the wood cells for preservative absorption; next a sudden submersion under a cold pentachlorophenol solution which contracts the expanded air in the cells. This creates a vacuum sufficient to pull the solution deep into the sapwood. Pole protection is sealed for life, insuring dependable service up to pole line obsolescence.

Linemen like LIFE-SPAN poles because they are clean, easy to handle, and safe to work on. Utility companies like them because they offer dependable service and they build good public relations for the companies using them.

To be sure, to be doubly safe . . . specify LIFE-SPAN Western Red Cedar Poles.

The same LIFE-SPAN treatment is also available for Fir, Western Larch and Lodgepole Pine.

CONSOLIDATED TREATING CO.
MINNEAPOLIS, MINNESOTA

For further information write any of the following:

SCHAEFER-HITCHCOCK CO.
Sandpoint, Idaho
Suppliers for Joslyn Mfg. & Supply Co.

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PAGE & HILL, INC.
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When you need tape—
here's your **GUARANTEE**

ACCURATE

QUALITY ELECTRICAL TAPES

Non-Deteriorating
Easy Tear-Off
High Tensile Strength
Maximum Dielectric

BLUEPRINT FOR KNOW-HOW! For over a quarter century, ACCURATE Tapes have enjoyed a reputation for quality among electrical men, everywhere. One reason for this steady demand is the modern plant that economically mass-produces the finest tape that money can buy. ACCURATE specializes in tape making—combining finest materials with experienced methods. ACCURATE tapes for the electrical industry are of consistent excellence—a consistency reflected in every roll bearing the familiar ACCURATE label. The next time you need tape, you'll find it's good business to make yours ACCURATE! For complete catalog, call or write the Accurate Mfg. Co. at Garfield, N. J.—Dept. D.

ACCURATE FRICTION TAPES

Quality made of highest grade rubber and finest cotton base. Affords maximum mechanical protection. Available in Standard and A.S.T.M.-Specification grades.

ACCURATE RUBBER TAPES

Offers high elasticity, excellent cohesion, high dielectric strength and super aging qualities; made in both Standard and A.S.T.M.-A.A.R. grades.

ACCURATE PLASTIC TAPE

Thin caliper reduces bulk in tight spots. Strong mechanically and offers high dielectric strength. Recommended for use wherever plastic tape is practical.

TAPE TIPS: FOR ELECTRICAL MEN

Using rubber tape that coheres without heat or extra pressure, makes taping jobs easier, quicker. That's ACCURATE, and super aging means your "wraps" improve with age. Remember—friction or rubber, ACCURATE Tapes make *accurate* wraps!

ACCURATE YOUR BEST BUY IN TAPE

MORE THAN A QUARTER CENTURY OF TAPE SPECIALIZATION

HIGH IN QUALITY
LOW IN MAINTENANCE

These words briefly summarize the 8400 type switch

Single pole of 600 ampere 34.5 KV. 8400 type switch on station post insulators.

Its unique blade mechanism provides high pressure wiping contacts that will insure clean contact surfaces and low mili-volt drop.

Ball bearings at vital points plus a powerful toggle mechanism result in smooth and dependable switch operation, even under severe sleet and ice.

Operating experience over long periods of time indicate extremely low maintenance costs.

Switches can be supplied with Nema standard insulators, or on station posts as shown in illustration.

WRITE FOR BULLETIN 327 AND GET DETAILED DESCRIPTION OF THIS EXCELLENT SWITCH

THREE

ELECTRICAL ENGINEERS EQUIPMENT CO.

MELROSE PARK, ILLINOIS

SWITCHBOARD INSTRUMENTS
SOCKET INSTRUMENTS
D-C AMPERES
AMPERES
MILLIAMPERES
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PANEL INSTRUMENTS
PORTABLE INSTRUMENTS
INSTRUMENT AUXILIARIES
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The most complete line in the industry!

In the complete line of Westinghouse Electrical Instruments, you're sure to find the *right answer* to your measuring requirements. Moreover, you'll get a wider selection for specific applications, whether it be a-c or d-c current and voltage, single or polyphase circuits, watts or vars, frequency, power factor, synchroscopes, temperature indicators, ground detectors or position indicators.

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Every Westinghouse Instrument is built to meet the rigid performance requirements of the American Standards Association. No more exacting guarantee of an instrument can be made.

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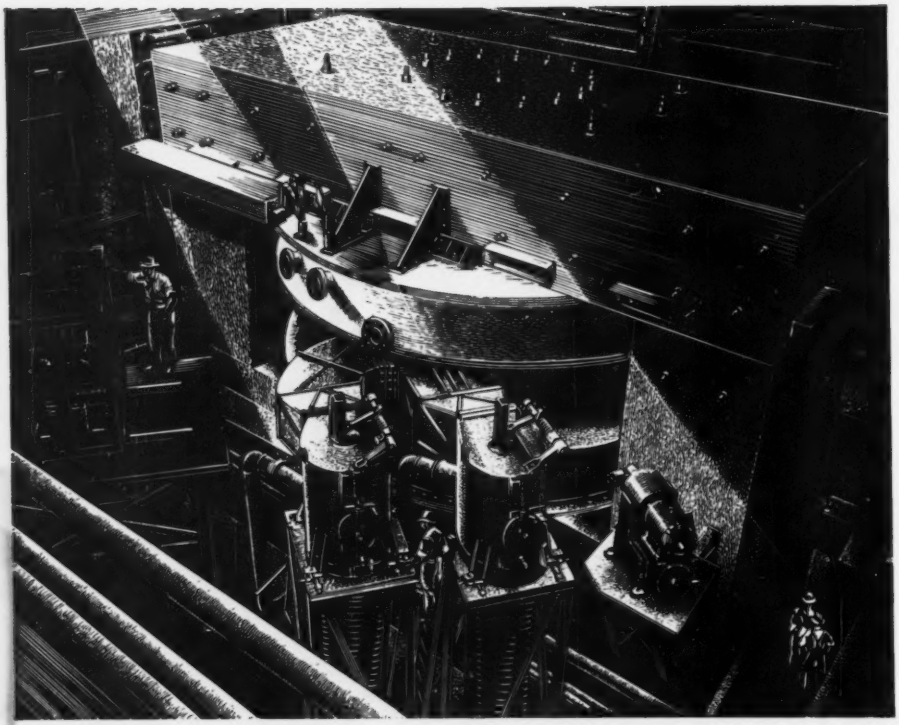
For complete information on Westinghouse Instruments write for Booklet B-4696. Address: Westinghouse Electric Corporation, P. O. Box No. 868, Pittsburgh 30, Pennsylvania. J-40406

YOU CAN BE SURE.. IF IT'S
Westinghouse
INSTRUMENTS

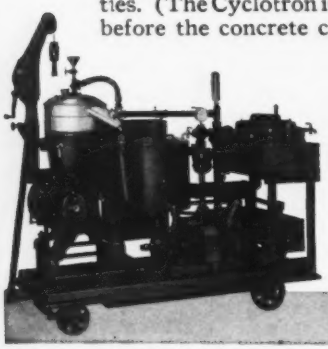


HOW TO KEEP AN ATOM-SMASHER SAFELY COOL!

A cyclotron generates tremendous heat when it smashes an atom. This heat is dissipated by thousands of gallons of insulating oil, and this oil must be dry and clean in order that the proper dielectric be maintained.

At Columbia University's great Cyclotron, a De Laval Centrifugal Oil Purifier keeps the oil free of all impurities. (The Cyclotron is pictured here before the concrete casing was applied.) Transformer oil and circuit breaker oil have been purified by means of De Laval centrifuges in many of America's largest power companies for over 30 years . . . It is still the safest way to restore the dielectric, for water once removed from the oil cannot recontaminate it.

The story of this Cyclotron is in the De Laval Centrifugal Review, Volume 15, No. 4. A copy is yours for the asking.



THE DE LAVAL SEPARATOR COMPANY
165 Broadway, New York 6 427 Randolph St., Chicago 6
DE LAVAL PACIFIC CO., 61 Beale St., San Francisco 5
THE DE LAVAL COMPANY, Limited, Peterborough, Ont.

DE LAVAL

INSULATING OIL PURIFIERS

V.C. CABLE

Wherever you need resistance to heat, oil and grease . . . specify Roebling Varnished Cambric

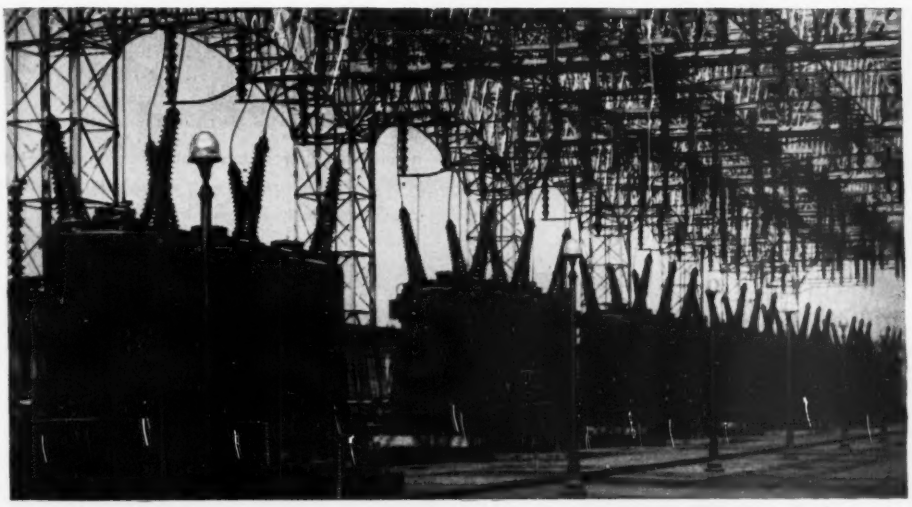
AS LEADS for generators, transformers, motor and oil switches . . . for general distribution of heavy power loads in manufacturing and industrial plants, your top specification is Roebling Varnished Cambric Cable. . . . Roebling V.C. is made in single conductor sizes from 2,000,000 C.M. to #14 A.W.G.; in multiple conductor sizes from 750,000 C.M. to #14 A.W.G. It is recommended for use up to 17,000v between phases in single or multiple conductor construction; and to 26,000v for single conductor grounded neutral.

Large quantities of Roebling's complete wire and cable line are now required in the rearmament program. The Roebling organization and distributors will do their best, however, to meet your delivery needs. John A. Roebling's Sons Company, Trenton 2, N. J.

Manufactured with solid conductors or stranded in a variety of strandings, coated or uncoated, according to your needs. Available in single or multiple conductor.

Insulated with varnished cambric tape, in accordance with I.P.C.E.A. and Underwriters' specifications unless otherwise specified by you.

For outside covering you have a choice of braid, for service in dry locations; lead, for service in damp locations; and for aerial use or direct burial we recommend a protective armor such as steel tape or galvanized round wire armor.



ROEBLING

Atlanta, 934 Avon Ave ★ ***Boston,*** 51 Sleeper St ★ ***Chicago,*** 5525 W. Roosevelt Rd ★ ***Cincinnati,*** 3253 Fredonia Ave ★ ***Cleveland,*** 701 St. Clair Ave, N.E. ★ ***Denver,*** 4801 Jackson St ★ ***Houston,*** 6216 Navigation Blvd ★ ***Los Angeles,*** 216 S. Alameda St ★ ***New York,*** 19 Rector St ★ ***Odessa, Texas,*** 1920 E. 2nd St ★ ***Philadelphia,*** 230 Vine St ★ ***San Francisco,*** 1740 17th St ★ ***Seattle,*** 900 1st Ave, S. ★ ***Tulsa,*** 321 N. Cheyenne St

There are important *Differences* in wire—

When we say Triangle Wire and Cable is better—you have a right to make us prove it. The best proof we know is to show how Triangle products are *different*.

For Instance

DID YOU KNOW THAT . . . *1* Glazon Building Wire has features which make the wire stronger, tougher?

The braid cover is based on Fiberglas—a continuous filament glass yarn which cannot rot, burn, absorb moisture or deteriorate with age.

DID YOU KNOW THAT . . . *2* Glazon is smoother and more flexible? It's only natural that a braid based on Fiberglas will be smooth, especially when that braid is covered with strong wax. Glazon Wire is easy to pull and fish because it's smoother and more flexible.

DID YOU KNOW THAT . . . *3* Wires and cables produced *from start to finish* under one roof are bound to be better?

At the modern Triangle plant in New Brunswick, New Jersey, copper enters in the form of wire bars and leaves as completed cable. All intervening operations—rolling, drawing, stranding, insulating, covering, testing, packing—are done under one roof, by a single organization, with unified responsibility from start to finish.

for *Extra* quality—at NO extra cost—insist on TRIANGLE!

TRIANGLE T IT MUST BE RIGHT

TRIANGLE CONDUIT & CABLE CO., INC.

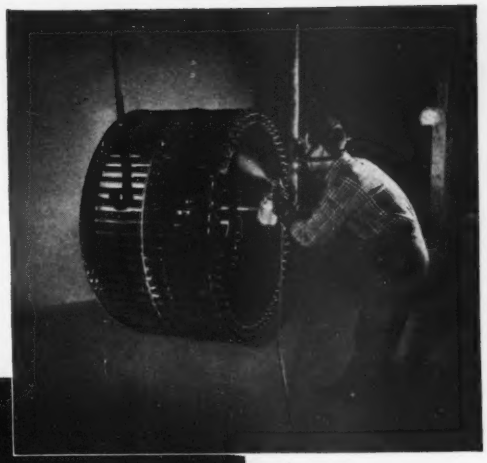
NEW BRUNSWICK, NEW JERSEY

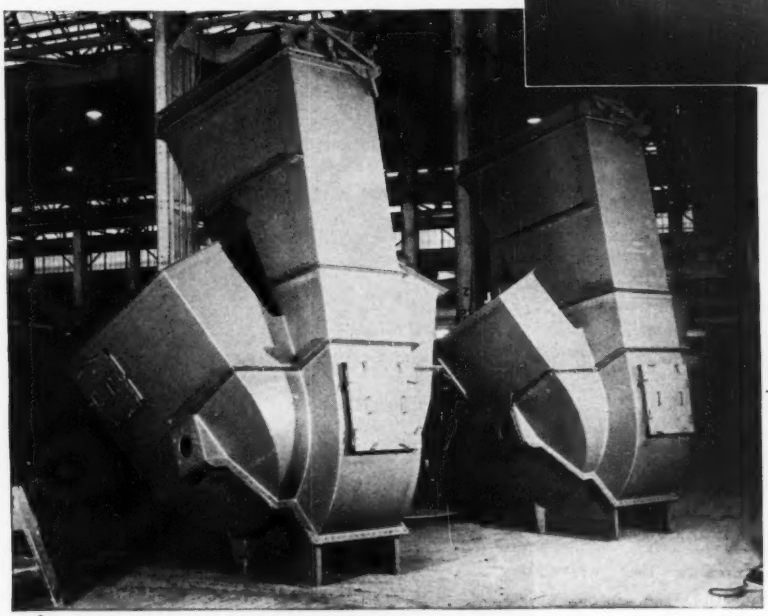
"Glazon" Building Wire • Bare Wire • Armored Cable • "Glazon" Non-Metallic Sheathed Cable • Service Entrance, Service Drop, Varnished Cambric Braided or Leaded, Trioprene Trench, Power and Parkway Cables • Rigid Conduit Hot-Dipped Galvanized • Electric Metallic Thin Wall Conduit • Flexible Steel Conduit

Mechanical Draft Fans
for
The City of Cleveland Municipal Power Plant

Boiler Contractors: Foster Wheeler Corporation

To meet ever-increasing demand for electric power, still another of America's great public utilities, The City of Cleveland, is expanding and enlarging its facilities and services.





Above is shown one of the 51½" Sirocco Wheels receiving its final coat of paint. The unique and scientific design of the Sirocco Wheel provides for unusual structural strength as well as unobstructed air flow.

Here are two of four American Blower Induced Draft Fans destined for the City of Cleveland Municipal Power Plant. Each fan is rated at 105,200 cfm at 375° F. at 13.5" static pressure. An order for four American Blower Forced Draft Fans is also in the process of construction. This is the second order of similar fans for the City of Cleveland.

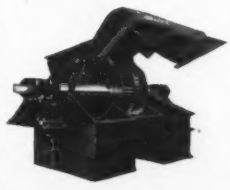
High static efficiency, low RPM, low tip speed, low inlet velocity, plus other important operating characteristics, make American Blower Mechanical Draft Fans well adapted to severe power plant requirements.

For further data, consult your nearest American Blower Branch Office.

AMERICAN BLOWER CORPORATION, DETROIT 32, MICHIGAN

CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO

Division of American Radiator & Standard Sanitary Corporation



Sirocco Induced Draft Fan

This type of Induced Draft Fan is being used on 1,000,000 #/hr. steam boilers.

YOUR BEST BUY AMERICAN BLOWER POWER PLANT EQUIPMENT

Serving home and industry

AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS • DETROIT LUBRICATOR • KEWANEE BOILERS • ROSS HEATER • TONAWANDA IRON

RECOMMENDED COMBINATION
For Lighting Heavy-Industry Plants

HOLOPHANE Lighting Equipment and MERCURY Lamps

●

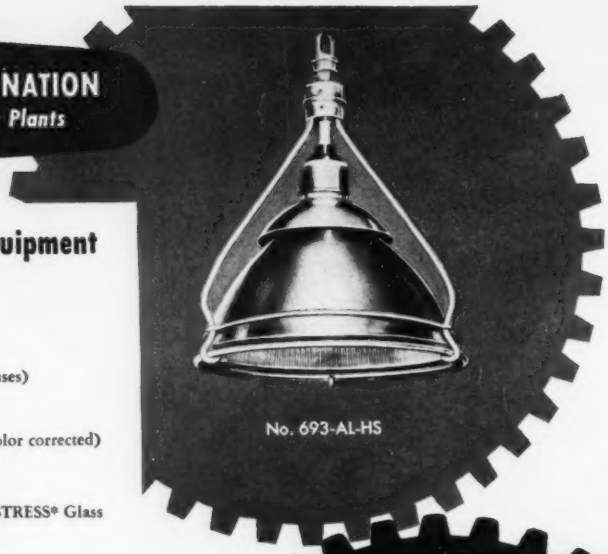
HIGH BAY LIGHTING
(Mills, motor rooms, shops and warehouses)

NO. 693-AL-HS—400 Watt A-H1 lamp

NO. 690-AL-HS—400 Watt E-H1 lamp
400 Watt J-H1 lamp (color corrected)

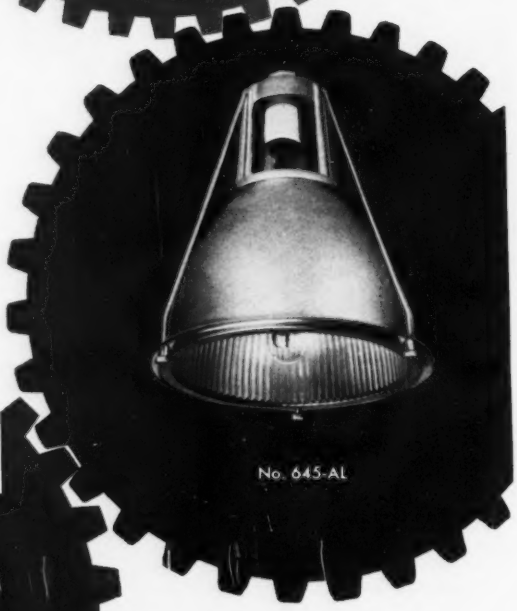
NO. 698-AL-HS—1000 Watt A-H12 lamp
(Also available for 500–750–1000 Watt incandescent lamps)

These units are available in HI-STRESS® Glass


No. 693-AL-HS

LOW BAY LIGHTING
(Wire drawing, bench work, inspection, stock rooms, etc.)

NO. 645-AL—400 Watt A-H1 lamp
400 Watt J-H1 lamp (color corrected)
(Also available for 500 Watt incandescent lamp)


No. 645-AL

OUTDOOR LIGHTING
180° LATERAL SPREAD
(Blast Furnaces, Coke Ovens, Roadways, Parking Lots and other outdoor areas.)

NO. U-850—400 Watt E-H1 lamp
(Also available for 500–750–1000 Watt incandescent lamps)

●

Mercury lamps offer economy advantages in steel mills due to high lumen per watt output, long life and efficient reflectors.

400 Watt E-H1 lamps, 20,000 lumens
400 Watt J-H1 lamp (color corrected), 19,000 lumens
1000 Watt A-H12 lamp, 57,000 lumens
(For comparison 1000 watt incandescent lamp gives 21,000 lumens)

No. U-850

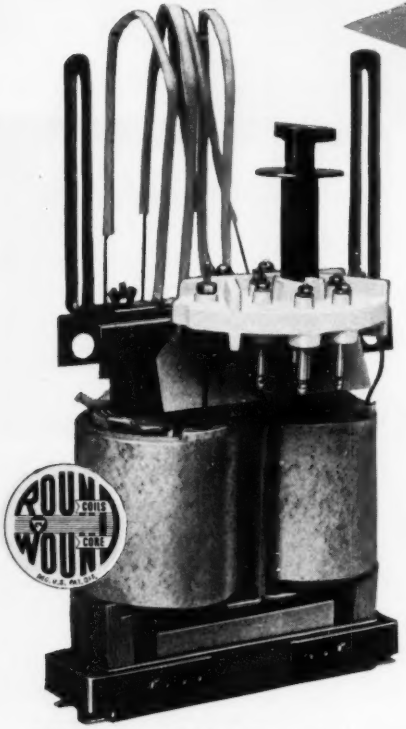
Based on the economical operation of these mercury lamps in combination with 1000 watt incandescent lamps or as mercury alone Holophane has developed HIBAY® LOBAY® and Outdoor Lighting Equipment designed for the severe conditions typical of steel mills and other heavy-industry plants. Twin and triple units are also available.

Holophane
Trade Mark
*Reg. U. S. Pat. Off.

HOLOPHANE COMPANY, INC.
Lighting Authorities Since 1898 • 342 MADISON AVENUE, NEW YORK 17, N.Y.
THE HOLOPHANE COMPANY, LTD., THE QUEENSWAY, TORONTO 14, ONTARIO

to make 3's and 5's out of 1½ kva transformers

...L-M's "UNIVERSAL" core-coil assembly



L-M Round-Wound "Universal" core-coil replacement assemblies are completely dried, impregnated, and shipped in moisture-tight containers. For immediate delivery from warehouse nearest you. 3 and 5 kva, 2400, 4800, 7200 and 7620 volts; fit all makes of tanks, from 1½ kva up. Same high quality characteristics and cooling as complete L-M Round-Wound transformers.

You can make 3 and 5 kva transformers out of your present surplus or overloaded 1½ kvas, easily, economically, with L-M's new "universal" core-coil assemblies. These fit practically all 1½ kva tanks of any make, and can be installed in your own shop, or by one of the L-M-Authorized Transformer Service Shops.

These "universal" core-coil assemblies are Round-Wound design, with all the advantages this design offers in exceptional cooling and other performance characteristics. Both 3 and 5 kva sizes come in 2400, 4800, 7200 and 7620 volts.

Use these L-M Round-Wound core-coil assemblies for quick replacement in emergencies, burnouts, or in the routine business of making big ones out of little ones when 1½'s no longer give your customers enough of what you sell.

They are available from stock in L-M factories or at any of the 45 L-M warehouses throughout the country; or for installation by L-M-Authorized Service Shops.

For details, installation instructions, specifications, ask the L-M Field Engineer or write Line Material Company, Transformer Division, Zanesville, Ohio (a McGraw Electric Company Division).

Some of the L-M-AUTHORIZED Transformer Service Shops

It is not necessary to send transformers to the Zanesville Plant—except for those in the Zanesville area. L-M's nearest Authorized Transformer Service Shop will give you dependable service.

Daley Electric Company
960 East Van Buren Street • Phoenix, Arizona
Dowzer Electric Machinery Works, Inc.
First and Castleton Streets • Mount Vernon, Illinois
Electran Company
4546-50 N. E. Alberta Street • Portland 13, Oregon
Interstate Electric Company
South 5th and E Street • Fort Smith, Arkansas
Jones Electric Repair Company
715 East 7th St. • Charlotte, North Carolina
Larsen-Hogue Electric Company
11510 South Alameda Street • Los Angeles 2, California
Southwest Electric Company
2617-21 South Agnew • Oklahoma City 8, Okla.
Line Material Company Plant
Zanesville, Ohio

For dependable transformer service...

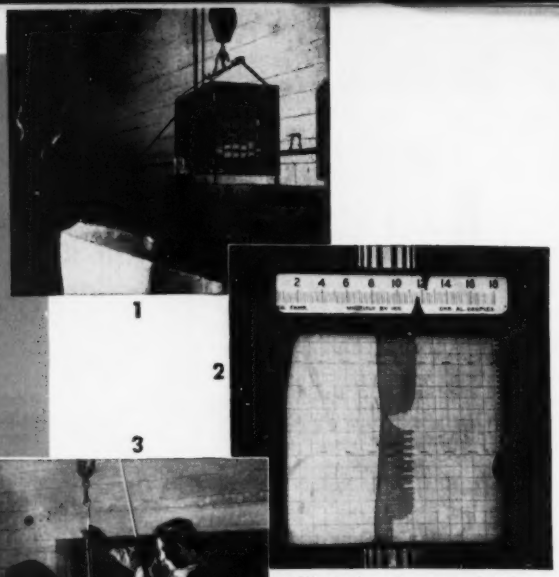
L-M-Authorized Service Shops provide complete equipment for repairs, genuine Round-Wound rewinding, and all necessary testing facilities.

LINE MATERIAL... Transformers

Complete Coordinated Equipment for Distribution Today

how L-M STOPS RUST

of line construction materials

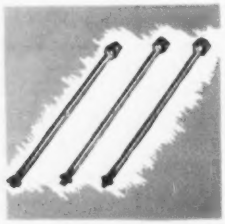


Illustrations show some of the important factors in L-M hot dip galvanizing. (1) improved methods of degreasing, pickling, and washing to assure clean surface and perfect adhesion . . . (2) precise temperature controls to assure even coatings . . . (3) centrifuging removes excess zinc to assure clean threads.

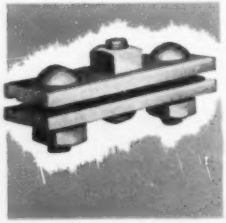
Good galvanizing, under controlled conditions, is the secret of the quality of L-M construction materials.

Pinholes in galvanizing invite rust. Uneven coatings wear through in spots. A coating that's too thick, or rough, makes nuts turn hard, slows down the lineman. So L-M takes all possible precautions to assure smooth, even coatings, that stop rust as long as possible.

For information about L-M equipment, ask the L-M Field Engineer, or call the nearest of 77 L-M sales offices and warehouses throughout the country, or write Line Material Company, Milwaukee 1, Wisconsin (a McGraw Electric Company Division).

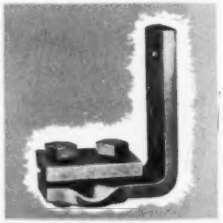


Strand Eye Anchor Rods, in single, double, and triple eye styles, do away with the elusive thimbles. Rod eyes conform to curvature of guy strand, permit the strand to be pulled tight without distortion.



L-M Guy Clamp, with high-strength bolts and Torkol-treated nuts for easy tightening, firm holding, with no thread-corrosion. Heavy steel, hot-dip galvanized. Square holes keep bolt from turning.

Machine and Carriage Bolts have clean-cut threads, true heads, ample tensile strength. L-M bolts 6" and longer have buffer points for easy driving —in, and for driving out without battering threads.



Universal Messenger Hanger for minimum clearance between pole and conductor. Flared groove prevents nicking the strand and permits use of this hanger on both small angle and straight runs.

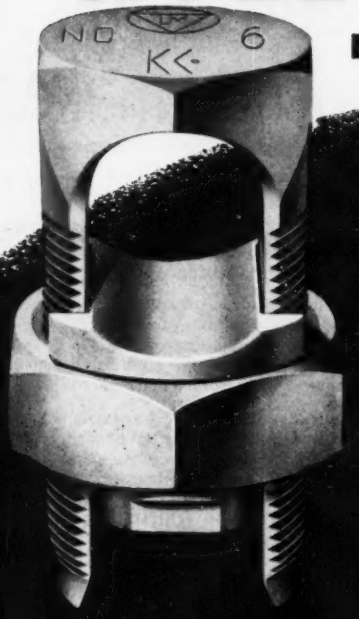
24-B

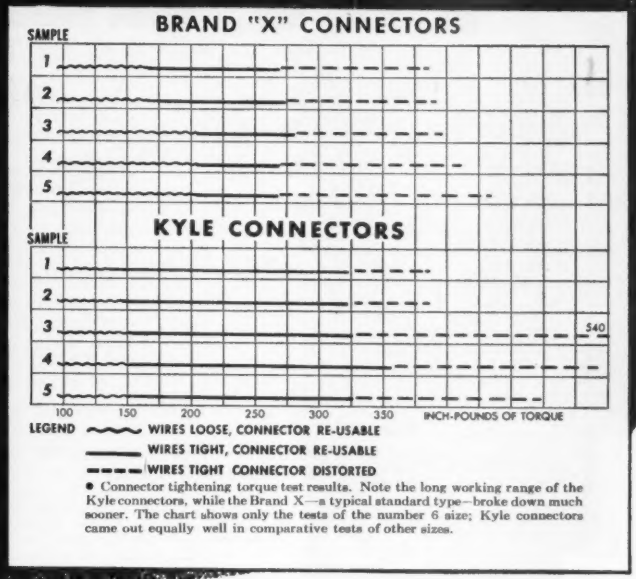
LINE MATERIAL . . .
Line Construction Materials

TORQUE TESTS SHOW

KYLE Split-Bolt Connectors

HAVE A LONGER WORKING RANGE





• Connector tightening torque test results. Note the long working range of the Kyle connectors, while the Brand X—a typical standard type—broke down much sooner. The chart shows only the tests of the number 6 size; Kyle connectors came out equally well in comparative tests of other sizes.

For our own information, we put the squeeze on a bunch of connectors—with a torque wrench. The test chart shows the results.

Note the *long* working range of the KYLE connectors, and the much *shorter* range of Brand X—a typical, standard-quality connector that looks about like ours. That's valuable information for *any* connector purchaser.

HERE'S WHAT HAPPENS . . . *Some* connectors—but not KYLES—have rough threads. That means extra torque to turn the nut, extra strain on the connector body. Often the pad fits badly and goes a little skew-gee, requiring still more torque. Something has to give—the connector body takes the beating.

But heavy-bodied KYLE connectors have clean, accurately machined threads, smoothly rounded edges, a close-fitting pad. The nut tightens easily, the pad slides up smoothly, the force is on the wire—and the connector comes up without damage while still holding the wire much tighter.

COSTS LESS TO USE . . . A connector that can be used only once is an expensive connector. A connector that can be re-used is more economical. KYLE connectors work better, last longer, and, as the chart above shows, they'll stand lots more torque and still come up ready for re-use. That makes it obvious that you get better connections, and lower costs, when you get KYLES, the long-range, long-life connectors.

• If you want to save money with quality connectors, ask the L-M Field Engineer for samples and a copy of Bulletin SC1 which gives details. Or write Line Material Company, Milwaukee 1, Wisconsin (a McGraw Electric Company Division).

TIGHTENING TORQUES FOR SPLIT-BOLT CONNECTORS RECOMMENDED FOR BEST RESULTS

Connector size	Inch-pounds
8	75
6	225
4	275
2	350
2 stranded	400
1/0	500
2/0	600
4/0	750

2R

LM

LINE MATERIAL Kyle Connectors

Why KYLE Reclosers outsell all other makes

Kyle single-phase type H and three-phase type 3H oil circuit reclosers have certain well-recognized advantages that are responsible for their wide leadership.

Kyle reclosers offer the widest choice of operating sequences. Sequences and ratings are easy to change, right in the field. Positive toggle action, fast opening and closing; do not depend on gravity; no motors or clockwork. Hydraulic mechanism is simple, trouble-free. Many safety features.

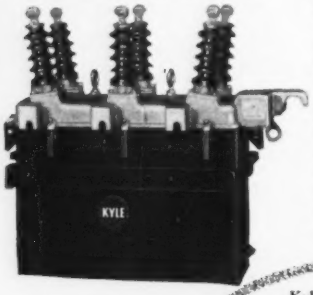
L-M offers the widest variety of reclosers. More Kyle reclosers are sold than all others, and L-M engineers have more recloser experience. Kyle reclosers are rugged, accurate, dependable. More economical to operate than fuses; their accurate coordination eliminates service calls and improves service.

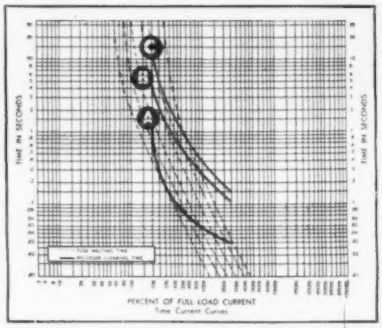
◀KYLE type H single-phase oil circuit recloser

Has all the Kyle safety features. Trip-free operating handle. Bushing terminals only live parts. Internal by-pass arrester. Sleet hood protects reset handle and operations counter.

KYLE type 3H three-phase oil circuit recloser

Provides individual reclosing and resetting on each phase for temporary faults; but if fault does not clear after three operations, recloser *locks out all three phases simultaneously.*





Only KYLE reclosers offer 3 operating curves, 7 sequences

Choice of three operating curves. In the chart, the time-current curves shown are A, fast operation; B, retarded operation; C, extra-retarded operation.

Choice of seven operating sequences. The following sequences can be obtained, quickly and easily, right in the field, without shop trips:

4 A's (four fast operations); 4 B's; 4 C's; 2 A's, 2 B's; 2 A's, 2 C's; 1 A, 3 B's; 1 B, 3 C's.

For 2.4 to 15 kv; six ratings from 5 to 50 amps; minimum trip currents from 10 to 100 amps; interrupting capacities from 150 to 1200 amps. Coils are quickly changed, *right in the field!*

GET THE WHOLE STORY ON AUTOMATIC PROTECTION

Ask the L-M Field Engineer for a copy of Recloser Bulletin CR1, or write Line Material Company, Milwaukee 1, Wisconsin (a McGraw Electric Company Division).

Kyle reclosers are now filled with "ORTO"® L-M's oxidation-resistant transformer oil.

LINE MATERIAL... Kyle Reclosers

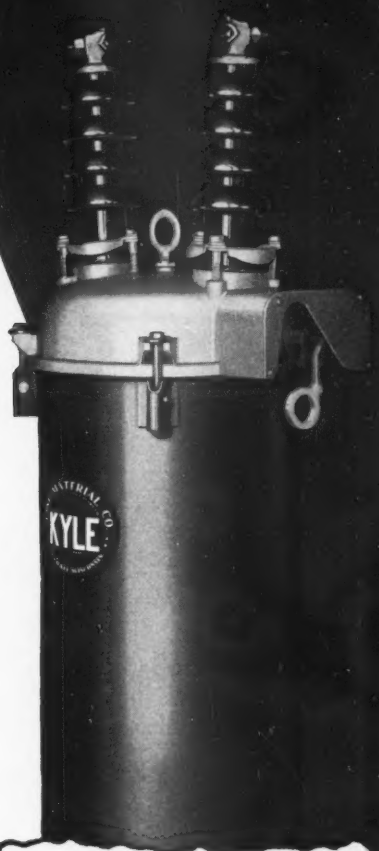
Complete Control Equipment for Distribution Today

KYLE

TYPE "L" OIL CIRCUIT RECLOSER NOW GIVES YOU UP TO

6000 amps interrupting capacity

IN NEW 140-AMP RATING



First recloser actually engineered for heavy-duty service ... full power-class design ... 110 kv insulation impulse level ... ratings up to 140 amps ... only real heavy-duty recloser in its class

Kyle type "L" reclosers cost a little more than lighter-duty reclosers, but they're worth the difference in service, performance, convenience, and freedom from maintenance. Even if you don't need the extra interrupting capacity now, you will need it to take care of future loads; and in the meantime you enjoy all the benefits of type "L" performance and economy.

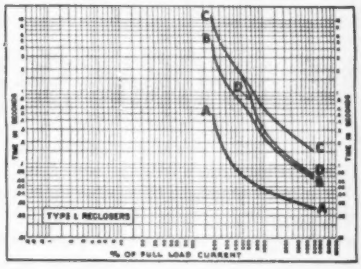
It's the Kyle oil cross-blast method of arc extinguishing, plus heavy-duty design, that makes it possible for the "L" to handle heavy fault currents up to 6000 amps.

The type "L" is the only recloser with so wide a choice of operating sequences. Four standard curves permit any sequence of operation to meet your coordination problems.

Sequence and coil changes are made right in the field—in a few minutes. To change to a coil of different rating, you just remove two screws. To change operating sequence, simply rotate a disc or change one small part. It's quick—and easy! Saves shop trips!

Extremely accurate; virtually no effect from ambient temperature changes. Positive fast operation; positive toggle closing—doesn't depend on gravity. Many safety features: cover and tank electrically dead—bushing tops only live parts; trip-free operating handle. Large sleet hood protects counter and operating handle; may be rotated in 90° steps. Rugged; shock-proof; trouble-free.

ONLY RECLOSER WITH 4 OPERATING CURVES



RATINGS

Coil Rating Amperes	Min. Trip Current Amperes	Maximum Interrupting Capacity Amperes At Maximum Phase-to-Phase Nominal Voltage of		
		4.8 kv	7.2 kv	14.4 kv
25	50	1500	1500	1500
35	70	2100	2100	2100
50	100	3000	3000	3000
70	140	4200	4000	3000
100	200	5000	4000	3000
140	280	6000	4000	3000

Read all about it!

Ask the L-M Field Engineer for a copy of Bulletin CR1A—on the type "L"; or write Line Material Company, Milwaukee 1, Wisconsin (a McGraw Electric Company Division).

18

LINE MATERIAL... Kyle Reclosers

Complete Coordinated Equipment for Distribution Today

The preformed construction is particularly helpful in the high-strength and extra-high-strength grades of strand. Here's a good example. Note how the unseized Form-Set strand retains its original shape, whereas the non-preformed type, after cutting, bushes out in all directions.

Why FORM-SET Strand is EASIER to handle

The basic reason, of course, is that Bethlehem Form-Set strand is *preformed* strand; the wires, one by one, are relieved of internal tension before being laid together. This is accomplished by giving each wire its permanent curl or shape before it goes into the strand with its neighbors.

Form-Set's reduced wire tension means several practical advantages. The strand doesn't "explode" when cut . . . it need not even be seized. Hence it slides quickly, smoothly, into the ends of fittings; there's no lost time, no pinching together of stubborn wires. Matter of fact, in Form-Set, there isn't any stubbornness at all.

Expensive? Quite the reverse. Form-Set strand costs very little more than conventional, non-preformed types. The extra charge is so minor it hardly warrants talking about.

Order a reel of Form-Set; have your linemen try it. Then, just as a check, ask them how they like this strand. We think they'll confirm what we've told you.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM STEEL

WHICH MAN IS THE EXPEDITER?

Customer, sales engineer, production manager — all three have a direct influence on the speed with which a switchgear order can be produced and delivered.

But the customer can be most influential by far!

For if he is an experienced buyer, he selects standard arrangements assembled from standard components — and in this way materially speeds engineering, order entry and production. Further, since standard construction evolves from expressed preferences based on the actual experience of thousands of users like himself, he obtains the best possible equipment at the lowest possible cost.

To speed your switchgear delivery

Let your I-T-E representative show you how standard components can be used for your requirements!

For *more dependable* Switchgear

specify I-T-E!

R&IE

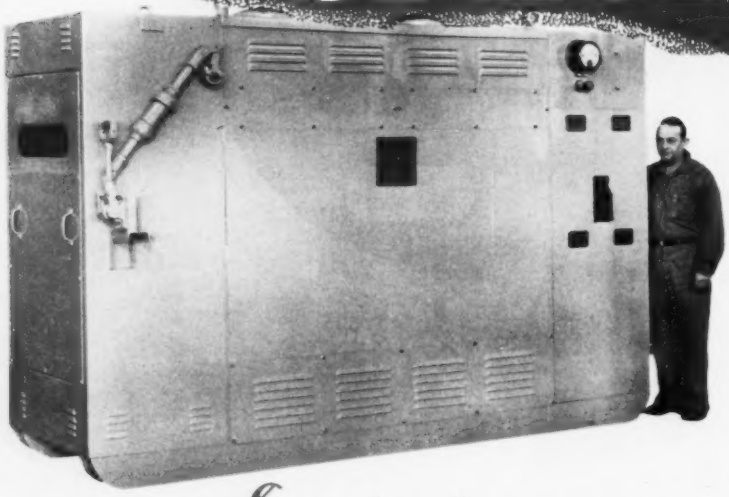
I-T-E Circuit Breaker Company • 19th & Hamilton Streets • Philadelphia 30, Pa.

Power Switching Equipment: Railway and Industrial Engineering Co., Greensburg, Pa.

Canadian Mfg. & Sales: Eastern Power Devices, Ltd., Toronto • Export Sales: Philips Export Corp., New York

• SWITCHGEAR • UNIT SUBSTATIONS • ISOLATED PHASE BUS STRUCTURES • CIRCUIT BREAKERS • MECHANICAL RECTIFIERS • RESISTORS • SPECIAL PRODUCTS •

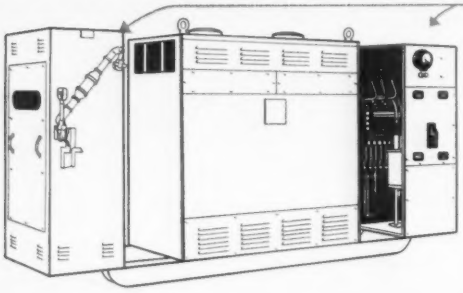
SPECIFY



Indoor unit substation including: High-voltage Disconnect Switch and Fuses. Air Cooled 1000 KVA STANDARD Transformer and Low-Voltage Circuit Breaker Cubicle with Metering. H-beam base permits portability. Suitable for platform mounting indoors.

WITH *Standard* TRADE MARK BUILT UNIT SUBSTATIONS

YOU'RE FREE, IF YOU WISH, TO SPECIFY THE MAKE AND TYPE OF SWITCHGEAR YOU PREFER



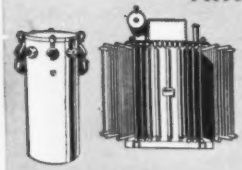
STANDARD builds transformers only . . . the heart of the load center. You have complete freedom in your choice of accessory equipment.

You specify the type and make of Switchgear and Cubicles which you prefer, and Standard will quickly produce a well-integrated unit — exactly designed to the proper dimensions and arranged according to your requirements.

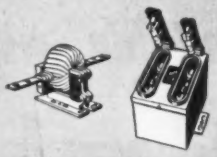
Standard assemblies provide maximum economy, combining lowest installation costs with the safest practices in the field of transformer application.

Special requirements are produced as quickly as standard jobs.

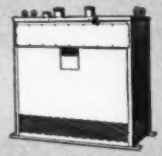
TRANSFORMERS FOR EVERY APPLICATION



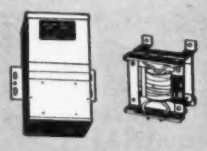
Liquid filled (sizes up to 10,000 KVA and 72 KV inc.)



Instrument transformers (for use on circuits up to 72,000 volts, inc.)



Dry type (up to 1000 KVA and max. voltage ratings of 4800)

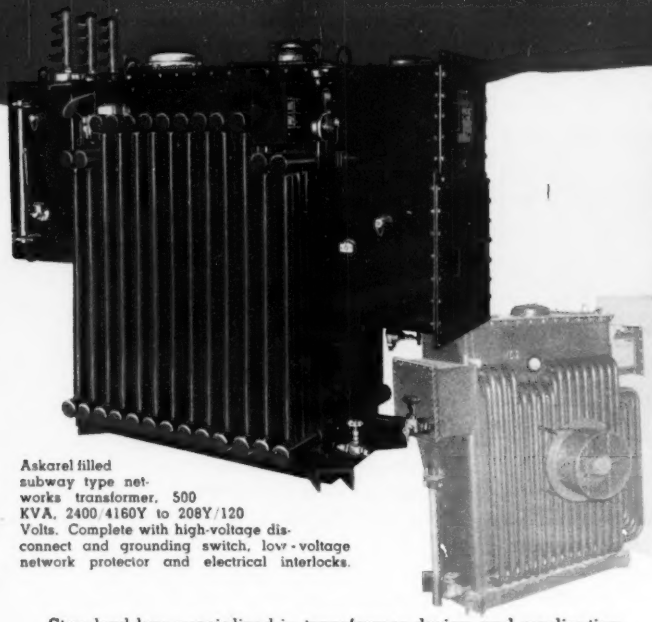


Control transformers (compound filled or open type)

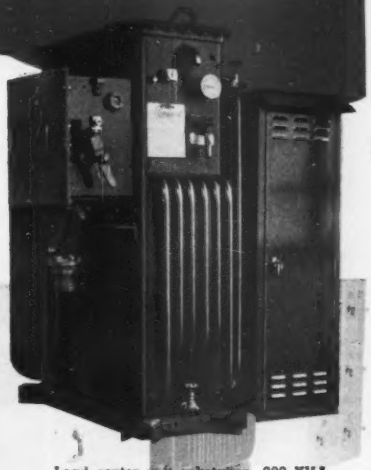
Standard
TRADE MARK ®

AIR, OIL OR ASKAREL COOLED

· LOAD CENTERS · UNIT SUBSTATIONS



Askarel filled subway type networks transformer, 500 KVA, 2400/4160Y to 208Y/120 Volts. Complete with high-voltage disconnect and grounding switch, low-voltage network protector and electrical interlocks.



Load center unit substation, 300 KVA Askarel filled transformer, equipped with high-voltage disconnect switch, pothead, key interlock and low-voltage cubicle containing secondary circuit breakers. Suitable for either indoor or outdoor installation.

Standard has specialized in transformer design and application for more than 30 years.

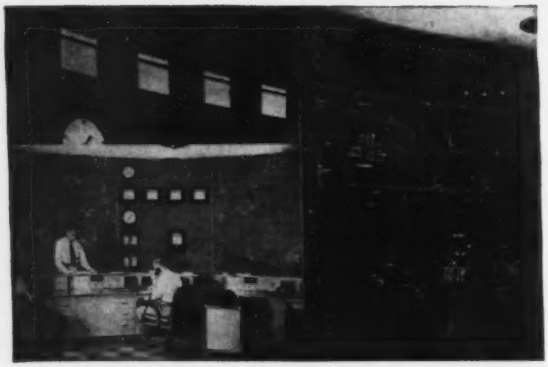
Every load center substation is custom-built to fit a specific need.

Whether unit substations are required for indoor, outdoor or underground installation, STANDARD can meet your most exacting requirements and include accessory equipment made by your preferred supplier. Write today for specific information.

SEE YOUR NEARBY Standard REPRESENTATIVE FOR ALL YOUR TRANSFORMER NEEDS

THE STANDARD TRANSFORMER COMPANY

WARREN, OHIO • REPRESENTATIVES IN PRINCIPAL CITIES



METAMETER AT BONNEVILLE AND GRAND COULEE DAMS. Bristol strip-chart Metameters are used by the Bonneville Power Administration. The receivers shown above are installed on the Bonneville dispatcher's board at the H. D. Ross Substation, Ampere, Washington, and record Bonneville 230 KV, Bonneville total power, Coulee total power (transmitted from Grand Coulee Dam approximately 250 miles away), and system total power.

METAMETER AT ROCKLAND LIGHT AND POWER COMPANY, MIDDLETOWN, N. Y. The 15 Metameter indicating receivers at right show kilowatts, water levels and kilovars at three hydro-electric power plants. The three at left measure and record pressure of delivered gas, and integrate flow into the Company's distribution system at points up to 50 miles away. The other Bristol instruments totalize flow during a given period of time in the three supply lines and also give a continuous reading and a chart record of total instantaneous flow through all three lines.

DISPATCHING MADE EASIER

Bristol Metameter* telemeters give the dispatcher up-to-minute readings of electrical and other measurements made many miles away

A complete and continuous visual picture of what is happening at key points throughout the system enables the dispatcher to accurately appraise conditions instantly and act with full knowledge.

With information from his Metameter receivers, he can keep in touch with load changes and direct the generation and transmission of power more economically and with greater ease. He can foresee emergencies and take the necessary steps to maintain schedules. Often, he can increase safe maximum loads in tie lines considerably.

Among the types of information Bristol Metameter telemeters make available to the load dispatcher are: the load at each tie-line point, output of each generating station, totalized output (on one instrument) of all generating stations, active and reactive power and power demand at key points, voltage and current at various points.

Generating stations use Metameter for information on output of each associated station (attended or unattended), total output, water level and water wheel gate position, water level in reservoirs, surge tanks, etc.

Readings can be transmitted any distance, over any two-wire circuit or its equivalent, carrier-channel, telephone, telegraph or radio (including microwave) . . . to recording receivers (narrow or wide-strip chart or round chart) or indicating receivers.

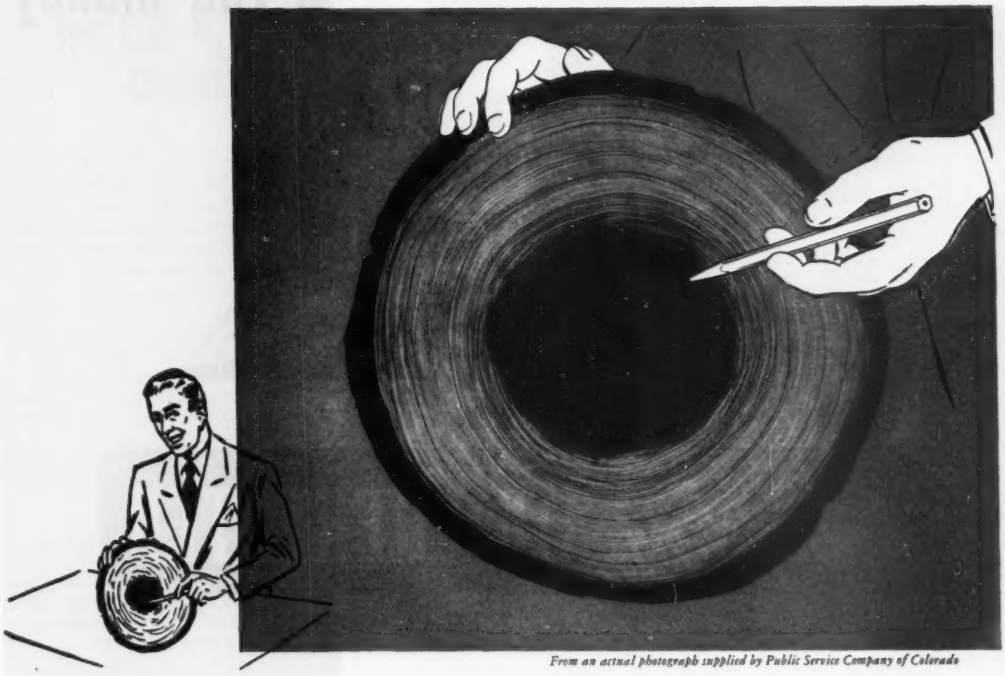
Metameter is the tried-and-proved telemetering system. Thousands are in use on all types of service. Write us for Bulletin M1700. THE BRISTOL COMPANY, 116 Bristol Road, Waterbury 20, Conn.

*Reg. U. S. Pat. Off.

BRISTOL

AUTOMATIC CONTROLLING, RECORDING AND TELEMETERING INSTRUMENTS

"...every management man should know how to MAKE STANDING POLES LAST LONGER"



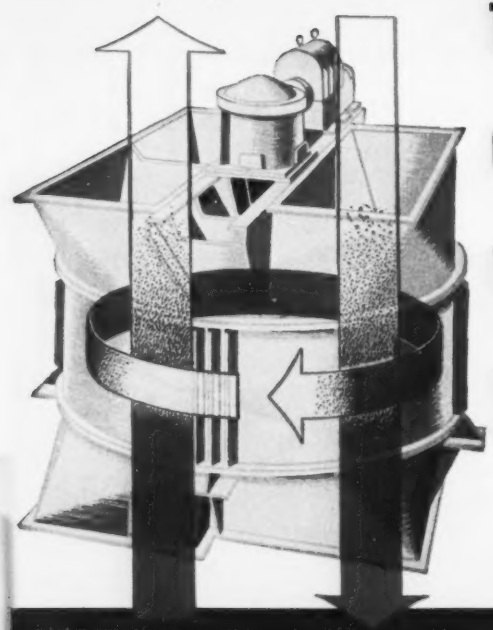
From an actual photograph supplied by Public Service Company of Colorado

OSMOPLASTIC *penetrates deeper to protect longer*

Here's graphic proof that the Osmoplastic groundline treatment is the practical and proven way to add *many years* of extra service life to your older standing poles. The above illustration is an actual photo of a test disc cut from 8" below the groundline on a Western Red Cedar pole by the Public Service Company of Colorado. This pole had originally been incised and treated with creosote. Six years ago it was inspected and Osmoplastic applied. The pole was removed from service for reasons other than decay in 1950 and discs were cut from the groundline area. The outer black band is the original creosote. Now look at the great yellow area! That's how far Osmoplastic penetrated right through the original creosote!

This complete yellow section was created by subjecting the disc to the zirconium alizarine reagent test which determines the presence of sodium fluoride in toxic amount. Osmoplastic is protecting this whole yellow area against decay and the only area not reached by Osmoplastic's super-penetration is the gray portion in the very center. Let us tell you more about our combined groundline inspection and treating service for older standing poles.

OSMOSE WOOD PRESERVING CO. OF AMERICA, INC.
1437 BAILEY AVENUE BUFFALO 12, NEW YORK



this preheater can save you money whatever your fuel

the *Ljungstrom* AIR PREHEATER

The Ljungstrom operates on the continuous regenerative counterflow principle. The heat transfer surfaces in the rotor act as heat accumulators. As the rotor revolves the heat is transferred from the waste gases to the incoming cold air.

All fuels burn better with preheated combustion air, and it is a "must" for many of them, such as high moisture powdered coal. In addition, the *continuous regenerative counterflow* principle of Ljungstrom permits reliable operation at low exit gas temperature. This assures the greatest possible heat recovery . . . reduces the amount of fuel required.

The efficiency and reliability of the Ljungstrom air preheater is a matter of record in industrial and utility plants throughout the country. That is why every year a constantly increasing percentage of the installed boiler capacity is equipped with Ljungstrom air preheaters.

If you are planning a new installation, or modernizing your present one, our engineers will welcome the opportunity to show you how the Ljungstrom can raise the efficiency of your plant.

THE AIR PREHEATER CORPORATION

60 East 42nd Street, New York 17, N. Y.

Kentucky Utilities Company, Inc.
chooses
Steel Towers
for 138 K. V. Single Circuit Line

● When Kentucky Utilities Company, Inc., selected American Bridge light steel towers for its 138 K.V. single circuit line, it found that these towers made possible more severe design conditions because they had sufficient strength to carry longitudinal, transverse and vertical loads. Also, Kentucky Utilities found that foundation erection was quicker and cheaper because the circular steel grillages of the towers were designed to permit machine boring of anchors. Conductors and ground wires were carried in the most economical spans and the exact arrangement desired. And, like most things made of steel, these towers have the stamina to provide extra years of service.

To help you take advantage of the outstanding superiority of steel for structures of this type, American Bridge Company makes available its experience and facilities for designing, fabricating and erecting. Why not submit any questions you might have to our nearest Contracting Office.

AMERICAN BRIDGE COMPANY

General Offices: Frick Building, Pittsburgh, Pa.

Contracting Offices in: AMBRIDGE · BALTIMORE · BOSTON · CHICAGO · CINCINNATI · CLEVELAND · DENVER
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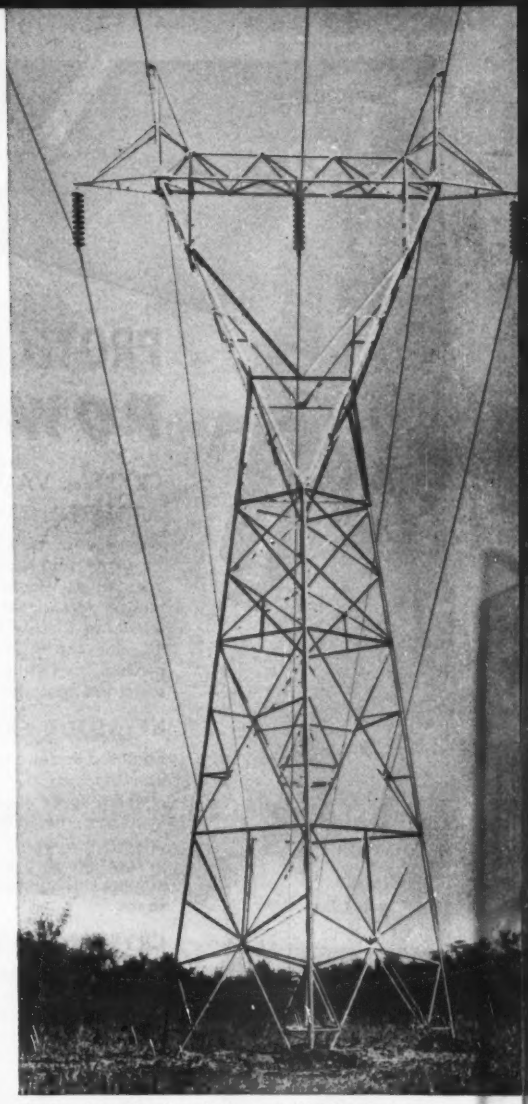
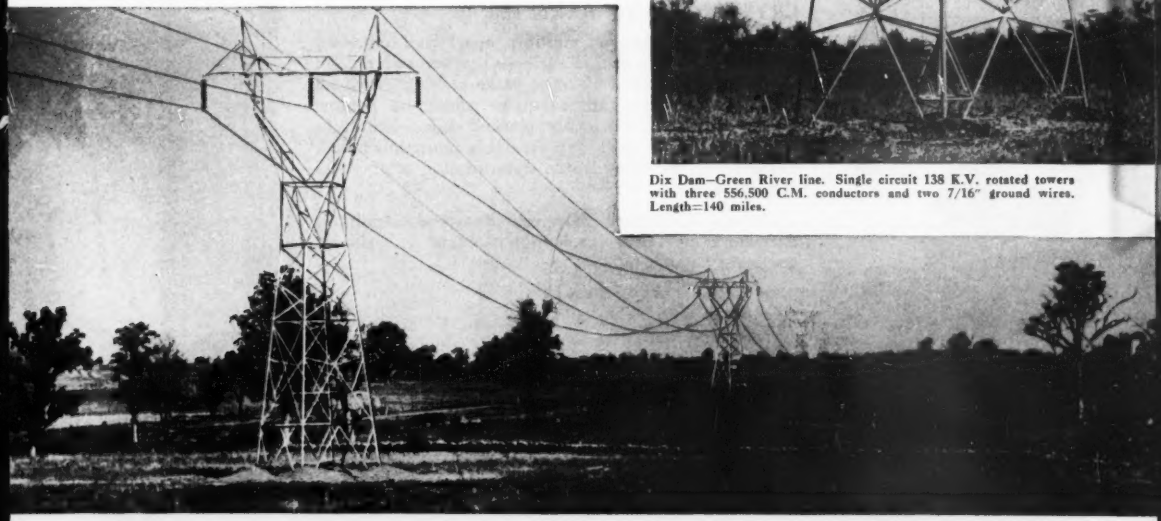
PITTSBURGH · PORTLAND, ORE. · ST. LOUIS · SAN FRANCISCO · TRENTON
UNITED STATES STEEL EXPORT COMPANY, NEW YORK



Dix Dam—Green River line. Single circuit 138 K.V. rotated towers with three 556,500 C.M. conductors and two 7/16" ground wires. Length=140 miles.



USS

AMERICAN BRIDGE

UNITED STATES STEEL

PROVED
PROTECTION FOR YOUR
POWER LINES
CRYSTAL VALVE VENTILATED GAP ARRESTER
High speed, multiple spark gaps kept free of corrosion by vents which permit movement of air and prevent accumulation of moisture in the housing. Glass housing makes gap inspection easy—condition of spark gap assembly readily seen at all times without removing arresters for testing. Amazing all-round performance is proved by thousands in service with almost 100% record of protection.
KEYSTONE EXPULSION ARRESTER
Enclosed series gap assures consistent operation . . . no line lockouts. Completely enclosed, this gap is not affected by weather elements, birds or other conditions. Vent passages in base seal, further assure that the body interior will be dry at all times. Safely withstands surge current far in excess of standard test value of 65,000 amperes of approximately 5 x 10 microsecond wave shape.
CRYSTAL VALVE ARRESTER
Embodying time-proved multiple, spark gap units and electrodes with discharge surfaces that are smooth and flat. Oxidized Silicon Carbide valve element provides low voltage drop and adequate protection against surge voltage . . . extremely marked valve action in conjunction with spark gap assembly interrupts follow current . . . no measurable deterioration after years of service.
There's a Crystal Valve or Keystone Lightning Arrester to meet every protection problem . . . Write for complete catalog today.
ELECTRIC SERVICE MANUFACTURING CO.
PHILADELPHIA 32, PENNA.
ESM

High Accuracy AT LOW ENERGY LEVELS

WESTON
Model 622

High sensitivity
• PORTABLE •
Instruments

Combining extreme sensitivity with high accuracy and a 6.1 inch scale, Weston Model 622 instruments are ideally suited for precise measurements of potential and current at the very low energy levels encountered in nuclear physics, electronics and electro-chemical research or in general test work. Hand calibrated, double pivoted, electrostatically and magnetically shielded.

These instruments are available as d-c voltmeters, millivoltmeters, milliammeters and microammeters; electrolysis voltmillivoltmeters and high resistance voltmeters. They are also made as thermocouple ammeters, milliammeters, and voltmeters; and as a-c rectifier type instruments. For technical data consult your Weston Representative, or write Weston Electrical Instrument Corporation, 594 Frelinghuysen Avenue, Newark 5, New Jersey . . . manufacturers of Weston and TAGliabue instruments.

WESTON *Instruments*

No. 2 — regarding the

★ *The Hi-Voltage Type A-W Switch is for line sectionalizing and substation work up to 46 kv.*

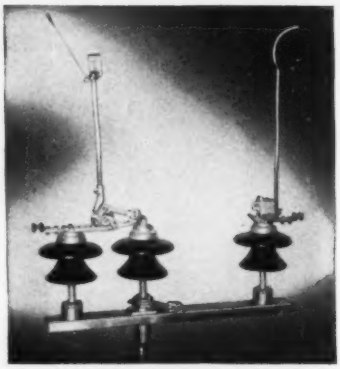
It's just one of many Hi-Voltage designs that assure the utmost in operating dependability. On the opposite page are shown some of the outstanding features that make the Type A-W the leader in its voltage rating.

Sleet, ice, years of standing idle have little effect on the operation of a Hi-Voltage switch. Certain operation is assured by the straight push-pull, close-open action of the switch arm. After clearing the contact housing, the arm is swung completely open by the powerful and precision-built operating mechanism.

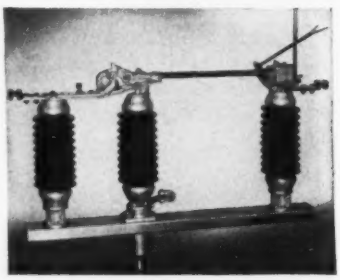
And the Type A-W reduces switch installation cost from 20 to 40%, because the mechanism is completely pre-machined and pre-fitted at the factory. All parts are positively identified . . . keyed to easy-to-follow installation data. Field cutting and drilling are eliminated.

Specify Hi-Voltage and gain the advantages of lower installation costs, more accurate installation and certain operation.

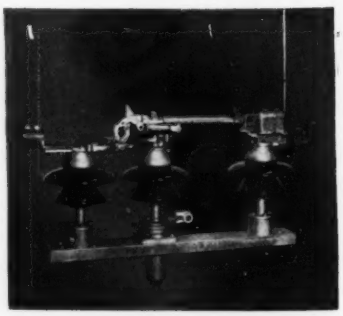
Future advertisements in this series will discuss the merits of other types of Hi-Voltage Switches. In the meantime, let your Joslyn Representative give you the whole story.



Open position of the conventional Type A-W air-break switch.



Station post insulators may be used for mounting the Type A-W.

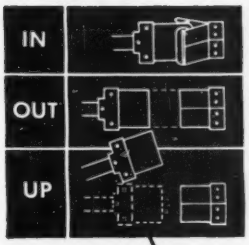


For heavy continuous duty, the Type A-W may be obtained in this 1200-ampere design.

HI-VOLTAGE

type A-W air-break switch

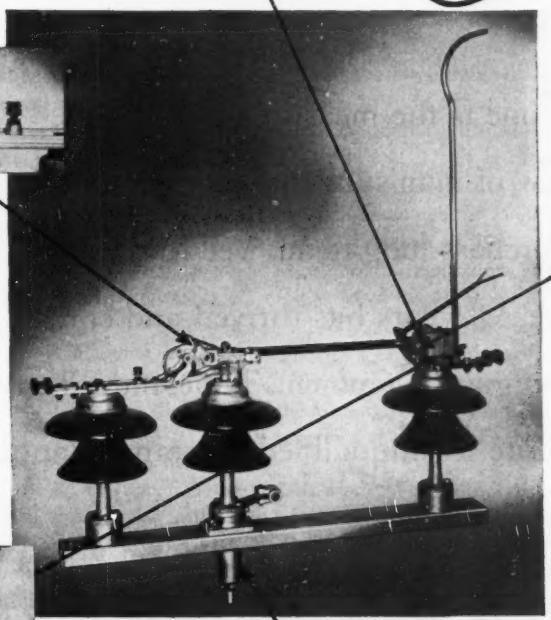
IN-OUT SWITCH ACTION . . . Straight-line motion of the switch-arm provides positive opening and closing of the switch.

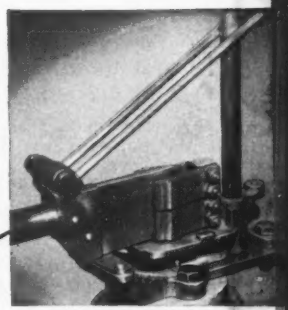


Hi-Voltage SWITCHES ARE AVAILABLE

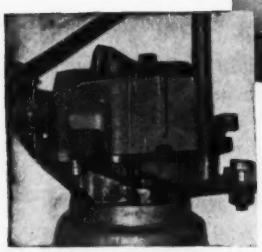
from 200 to 3000 Amperes, 7500 to 161,000 Volts for upright, underhung or vertical mounting.

OPERATING MECHANISM . . . A direct mechanical linkage. Uses no cams or rollers to deliver smooth powerful action. There is nothing to stick, bind or adjust.

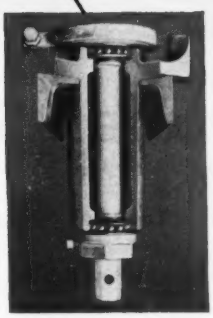




SILVER-NICKEL CONTACTS combine low resistance with low friction. Stainless steel springs maintain maximum conductivity.



CONTACT HOUSING protects contacts against sleet, dirt and arcing. Also, it acts as an ice breaker.



MAIN BEARING carrying rotating insulator is a forged steel spindle mounted in monel ball bearings and stainless steel races. Never requires lubrication.

ALSO AVAILABLE!

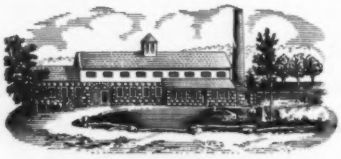
- Grounding Switches
- Manual and Automatic Control Mechanisms
- Mechanical Interlocks
- Hi-Voltage Fuses
- Cross-arms and Mounting Frames
- And all customary accessories

EQUIPMENT COMPANY

4000 EAST 116th STREET • CLEVELAND 5, OHIO

Time

Time is the measure of all things. Few of man's inventions can stand its merciless judgment. Yet Kerite for over 90 years has thrived and spread and gained renown. Time, indeed, gives Kerite its unqualified recommendation.



THE KERITE COMPANY

NEW YORK CHICAGO SAN FRANCISCO GLENDALE 4, CALIF.

Kerite Insulation—Your Cable's Best Life Insurance

Editorials

Keep On Selling

There are three possibilities that can affect electric utility sales operations in the days ahead. Without weighing the likelihood of any of them, the forces and chances for and against, let us look at them and consider the to-be-expected effect of each.

One possibility, granted to be the most far-fetched, is that soon there will be an about-face. The shadow of impending war will disappear, and the pressure of defense preparation will be quickly relieved. In view of this possibility, remote as it is, there should not now be allowed any relaxation of utility sales effort.

The second possibility is full-scale war in the immediate future. In thinking of this it is important always to keep in mind that war is a possibility, not an inevitability. To regard it even as a probability is to abandon hope, to throw up hands, and to quit. The danger here comes from fear.

Certainly if war comes, comes soon, the civilian economy quickly will be restricted to the bare minimum needed to support the military effort. But until the dread day arrives, if it does, we must go on as if we did not expect it. We must prepare for it but not anticipate it. In the meantime utility sales activities should continue, for to abandon or radically curtail them would be to give way to fear.

A third possibility is that we shall live indefinitely, perhaps for a generation or longer, in a state of readiness for instant, all-out, reaction to aggression. This means that after the first great work of organization for defense is completed, we shall come to a sort of armed-camp existence.

The prospect in this third possibility is that of a comparatively short time in which the need for selling will seem, but not actually be, less pressing. It will seem to be less pressing mostly because of newspaper head-lines—shortages, controls, stockpiling, new alphabetical agencies, all the organizational activity of a nation mobilizing for defense in a hurry.

The need for selling will not be less pressing because, in spite of the headlines, there will be plenty of merchandise to sell, and it will be harder to sell it. It is estimated that production of major electrical appliances in 1951 will be 20% under that of 1950. But this is a volume higher than in 1949. Higher prices and taxes, credit regulations, emphasis on saving, reduction of market resulting from scare buying in 1950, more vigorous competition, these and other factors will make selling harder in 1951.

The period of mobilization past, we shall settle down to living in the world as it then is. We hope that it will be like that of today.

It would be folly indeed to allow sales forces to disintegrate during the mobilization period. They would just have to be rebuilt for the soon coming time when we are over the hump and have adapted ourselves to the way of life then possible to us.

Some pages later in this issue there is a feature presentation of the subject of this editorial. The treatment of the matter is somewhat lighter than here, but the argument is just as serious. People in sales departments can be excused from reading the feature because it is their story and presumably they know it well. But it should be required reading for all other utility folks, engineers especially.

Panel Instrument Dimensions

Centralization of power plant controls in a control room has resulted in the moving there of many instruments that used to be scattered about the plant. Many problems are arising from this concentration, and some are not moving fast enough to solution. One is very definitely that of the mechanical instruments. In fact the situation is so incongruous that those who design the control panels are labelling the mechanical instruments outright headaches.

Those instruments are in much the same heterogenous stage that the electrical instruments were 25 or 30 years ago. As long as they were located out in the plant where the boiler, turbine, and pump operators had to see them from a considerable distance large size was an advantage. Now that the observers are operators desked in a control room, large size is no asset. On the contrary, they should be made to match the uniform dimensions of the associated electrical instruments. They should meet the same objectives of well-lighted scales, flush mounting, adjustment and installation from the front as are guiding the rapid evolution of the electrical instruments.

Argument may be offered that some of the chart instruments could hardly be reduced to 4¼ or even 6-in. squares, but the answer is that many of them could be located on the bottoms or backs of the boards. Instantaneous indications could be afforded at eye-level by console pointer instruments.

Control room panels are verging toward functional arrangement of all the instruments. It is not necessary that pressures, flows, and temperatures shall be shown by bulky meters. Their legends rather than their inordinate size can register their new mission in the control room.

Homogenized Safety

Says the foreman to a transferee "Forget what that—taught you in the other line gang, this is how we do it here." That may well be an extreme example, but it typifies what some safety supervisors encounter within their own organizations. Such sentiments constitute a serious bar to promotion of safe practices but probably no more so than the lack of uniformity in safety rules from company to company across the country.

It should not be so impossible to achieve agreement on what procedure is safe for a particular operation. Admittedly there are differences in equipment, differences in configuration details, differences in organization, and differences in personalities. But exactly such differences bedeviled the pole-line construction situation when the movement for the National Electrical Safety Code was initiated by the Joint Use Conferences in Connecticut. All was chaos and opinionation at the beginning—prima donnas all. It did not seem that there could be agreement on clearances and separations partly because the hazards were unsupported by clear-cut statistics. Nevertheless, the NESC emerged after the physical facts were gradually recognized as nation-wide in import and in prevalence.

There are far more statistics to set the pattern for unified safety than there were available as background for the NESC deliberations. For example, it is known that 15% of the 10-year fatalities in electric utility operations were due to hand contacts. The victims were not wearing their rubber gloves at the moment. Ergo, they either (1) never wore them, (2) had not yet put them on, or (3) had taken them off temporarily. The crux in (2) is—When should they have put them on?

It should not be so hard to infer that some 160 lives could have been saved by prescribing that the men should have had them on when they (1) left home, (2) left the truck, (3) left the ground, or (4) reached the danger zone of contact.

Similarly for any other issue. If one by one these differences of opinion could be resolved in the face of persuasive facts, there would be more unity in accident prevention. Employees would know by universality of regulations that the experts had agreed and they as employees were confronted with unanimity rather than diverse opinion.

"Electrical World's" issue of October 9 has had widespread dissemination in reprint form. Thousands of copies have been asked for by utilities, consulting and construction firms, electrical manufacturers, industrials, insurance companies, and others. There has not been a single dissent from any of the "remedies" proffered to take the "risk" out of "routine" operations. That in itself is a testimonial to the craving for unity in safety. Such unity is overdue.

Job-Training Help For Industry

The Association of University Evening Colleges has set up a program to cooperate with business companies in their own communities by working out training courses of the kind that will be needed more than ever under the pressure of defense production. What the colleges affiliated with this association are doing is not well known to industry, and it seems clear that many companies are now looking for help of just the kind these colleges can render.

Seventy-six colleges and universities are offering their facilities—to be used with those of industry and business—for evening courses all over the country. The institutions are members of the Association of University Evening Colleges. They are located in the chief urban centers, close to the industrial plants and commercial establishments that will face man-power shortages. They have the necessary space and experienced administrative personnel, with industry and business as sources from which to draw instructors on a part-time basis.

Courses will include subjects concerned with management, supervision, sales, and services auxiliary to management—not with trades, crafts, machine operation, or other manual skills. You may profit materially by looking into your local facilities.

The Electrical Week

INDUSTRY MOBILIZATION — Charles F. Kells has taken over as acting director of NPA's Power Equipment Division. He is to be sworn in as director this week (p 88) . . . Depa expects an increased number of applications for quick amortization from utilities (p 88) . . . NPA has begun to issue DO's to electric utilities for second quarter aluminum (p 88) . . . PED may be split up when the Controlled Materials Plan is put in effect (p 89) . . . NPA is in trouble over its DO plan for MRO orders. Suppliers are getting more DO's than they can handle and all DO's are equal (p 89) . . . Watthour meters are now being handled by PED's Pole Line Section instead of NPA's Scientific Equipment Division (p 89) . . . Depa will add two deputy administrators and has secured a large number of industry people to bolster its staff (p 90).

WASHINGTON—Investor-owned electric utilities have some arguments why the Congress should reject the federal power program. The utilities say they can save the taxpayers money and the nation scarce defense materials (p 91) . . . Truman will press for legislation to carry out the recommendations of his Water Resources Policy Commission (p 92).

ELSEWHERE—Former clerical workers of Puget Sound Power & Light Co transferred to the payroll of Seattle City Light are unhappy. They charge that their pay has been cut sharply. City Light says it isn't so; the pay cuts were modest (p 90) . . . America is in a transition period from a peacetime to an arsenal economy, Col Willard Chevalier, McGraw-Hill executive vice president, told the National Electrical Manufacturers Association at Chicago (p 93) . . . Techniques for controlling corrosion were presented at the annual meeting of the National Association of Corrosion Engineers at New York (p 94) . . . A Brown-Boveri, 220-kv, airblast breaker successfully interrupted 11 million kva in 2½ cycles in tests on the Bonneville Power Administration system (p 95) . . . And output reversed its trend of recent weeks and shot up over the 6.9-billion kwhr mark in the week ended March 17 (p 97).

• • •

One of the most critical materials, columbium steel, is being engineered out of new steam generating plant plans.

You can take it as a good sign as long as the utilization conservation branch of Depa's Power Supply Division remains vacant. It will direct brownouts and the like, when and if. Right now, Depa officials happily say they are in no hurry to staff the branch.

Latest word is that the Interior Department appropriations bill won't get out of the House subcommittee until "considerably after Easter." For part of the public power program it is considering see Page 91.

Patting our own back: Defense Electric Power Administration has reproduced "Electrical World's" report on Depa (EW, March 5, p 4) for use by its staff and field reporters.

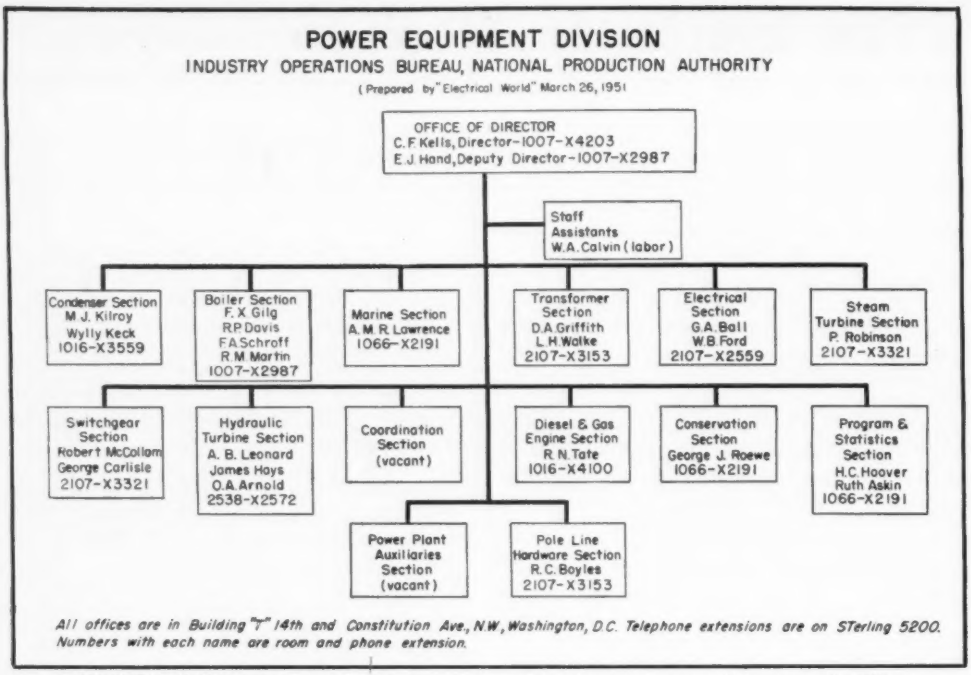
Westinghouse has awarded $110,000 to 400 young scientists in the ten years it has sponsored the annual science talent search among high school seniors.

Rumor Dept—C. Wesley McAfee, president of Union Electric Co of Missouri and Electric Energy, Inc, is being considered for the presidency of the New York Stock Exchange.

Opponents of the St. Lawrence seaway and power project will get their chance before the House Public Works Committee beginning April 2.

Notes From The News

Engineers are running cold water through 900 miles of pipe laid in newly-poured concrete at Hungry Horse Dam, Montana. Without the forced cooling, it would take 25 years for the 3 million cubic yards of concrete going into the dam to cool . . . Central Ohio Power Co plans to discontinue operation of its Spencerville generating plant because the installation has outlived its usefulness . . . Florida Power Corp joined with the state's sportsmen in ridding Lake Talquin of water hyacinths. The plants threatened to ruin the lake as a fisherman's haunt and also caused the utility considerable expense at the power dam which created the lake. Florida Power contributed $3,500 to the campaign to rid the lake of hyacinths . . . A polio victim was moved from a hospital in Wisconsin to another closer to home with the cooperation of Wisconsin Power & Light Co. The power company provided a mechanic to service a portable generating unit used to operate the patient's iron lung during the trip and a service truck to make connection to electric lines in case the portable unit failed.



NEW ORGANIZATION CHART of NPA's Power Equipment Division shows latest staff changes and additions

Quick Amortization Pleas Expected from Utilities

Defense Electric Power Administration last week expected an increased number of applications for rapid tax write-offs on electric generating capacity expansion.

Deadline for filing applications for facilities started on or before Sept. 23 was March 23. After that date applications are to be filed at least six months prior to the start of construction.

First power capacity applications included numerous industrial plants as well as some utilities, but Depa officials believe that utilities will turn more and more to the accelerated amortization program. The reason is that the tax write-off device will help maintain prescribed or preferred debt-equity ratios in new financing.

Applications for certificates of necessity permitting speeded amortization should be filed with the Defense Production Administration (not Depa). DPA is located in the old General Accounting Office Building, between 3rd and 4th and E and F Sts, NW, Washington 25, D. C. They are still being filed on form NSRB-140, used while the program was under the National Security Resources Board prior to the establishment of DPA last year.

Power plant applications are sent to Depa by DPA. Thus far, Depa has been working on criteria for evaluating the applications, but a flow of recommended projects is expected to begin soon. Depa's recommendations are made to DPA which actually issues the certificates.

Kells, Acting Director

Charles F. Kells last week became acting director of the National Production Authority's Power Equipment Division, succeeding Robert M. Hatfield, Jr, who resigned (EW, March 19, p 4). Kells, from the engineering department of West Penn Electric Co, New York, is expected to be sworn in formally as director this week.

NPA Issuing Utility DO's for 2nd Quarter Aluminum

National Production Authority has begun to issue DO's to electric utilities for second quarter orders of aluminum conductor.

Here's the way the new program works. NPA has assigned a quota of aluminum for electric power use in the second quarter. Exact amount has not been revealed, but it's understood to be less than Interior's Defense Electric Power Administration had requested.

Depa, which under its order EO-1 required electric utilities to file statements of their major construction plans and aluminum copper requirements on forms DPA-2 and DPA-3, screens this data to determine aluminum needs. The screening includes determining the "essentiality" of the construction in which the aluminum conductor is to be used. Depa sends NPA a brief recommendation for approved allocations of aluminum conductor.

NPA then issues to the electric utilities an authorization form permitting

the utility to mark DO-48 on orders up to a specified quantity of aluminum conductor for use in the second quarter. The number 48 is merely NPA's code number for all Interior agency programs, and a DO-48 has neither more nor less priority than other DO's.

This is only the start of the materials program for the electric utilities for the second quarter, and beginning with the third quarter the Controlled Materials Plan is slated to come in for all industry.

A similar scheme to the DO's for aluminum is in the works for copper, but steel is less definite. Some assistance is expected to be arranged to meet electric utility requirements for some scarcer types of steel, however.

Also expected soon is an NPA order covering minor plant additions which are not receiving any DO's in the aluminum program. Details of this order are under study. It is expected DO's will be permitted up to a certain percentage of the minor plant additions during a base period.

•

PED May Be Split Up When CMP Takes Effect

National Production Authority's Power Equipment Division may be split up under a reorganization plan scheduled to take effect when the Controlled Materials Plan is put in, probably July 1.

NPA's divisional product assignments have been reviewed and a new list with new divisions proposed. Under this tentative plan, the present PED would become the Engine and Turbine Division. It would include all present PED sections except transformers and switchgear. These items would go into a new Electrical Division which would include most of the products now under the electric section of NPA's Machinery Division.

The new assignments are not final and are drawing fire. PED covers major power equipment items in one division which can press for power expansion requirements as an integrated program. It is asking that transformers and switchgear not be taken away from other major power equipment.

On the other hand, the proposed new Engine and Turbine Division is presently slated to include such non-power items as septic tanks.

ROBERT M. HATFIELD, JR, right, receives plaque on his retirement as director of NPA's Power Equipment Division. Making presentation are F. J. Hand, left, deputy director; Frank E. Hutton, retiring alternate director, and Charles E. Kells, Hatfield's successor. Plaque contains pictures of staff and copy of PED article and organizational chart printed Feb. 26 on p 64 of "Electrical World"

MRO DO's Bring NPA Trouble from Suppliers

The National Production Authority was prepared for trouble when it issued its maintenance, repair, and operating supplies (MRO) order, (EW, March 5, p 13) but not for the kind of trouble it got. It has been the suppliers of MRO goods—not the big consumers—who have voiced the loudest complaints.

The whole stew boils down to another serious test of NPA's jealously guarded single-band priority system. Under the single-band system a DO for a civilian industry MRO item has the same weight as an MRO order from a maker of jet engines. So far, formal objections to this provision have been made to NPA by makers of paint, dental supplies, and cotton duck and by producers of artificial graphite. NPA expects more.

Producers of artificial graphite pointed up the problem. They make electrodes for electric furnaces and electrolytic anodes for chemical processing plants—both prime defense supporting industries. Graphite products were classed as operating supplies in the MRO. The industry has warned NPA that when the anticipated flood of DO-rated orders hits, they won't be able to meet the needs of defense industries which supposedly are the more important.

NPA hasn't committed itself on a method, but studies are underway to safeguard "top essential requirements." A super-DO would, of course, mean the end of single-band priorities.

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Meters Shifted to PED

Watthour meters have been transferred to the Power Equipment Division of the National Production Authority. Under previous product assignments, the meters had been in NPA's Scientific Equipment Division (EW, March 5, p 12). Now they are under PED's Pole Line Section, headed by R. C. Boyles. PED officials hope some DO assistance may be made available for watthour meter manufacturers, but the program has not yet taken shape.

2 Deputy Administrators Being Added by Depa

Defense Electric Power Administration's staff continues to grow although several major positions are still vacant.

Present plans call for naming of two deputy administrators to serve under Administrator C. B. McManus. One will be from the private utilities and the other from federal or public power. Announcement of the positions has been delayed by difficulty in finding a public or federal deputy.

Two acting special assistants to McManus have been designated: Francis A. Kolb, Cleveland Electric Illuminating Co and formerly in the maintenance, repair and operation branch of Depa's Materials and Equipment Division; and Warren H. Marple, Bonneville Power Administration.

Richard Grant, Commonwealth Edison Co, has been named a Depa consultant and is serving in the Materials and Equipment Division. Isaac Jeffery, Bureau of Reclamation, is serving as a special assistant to W. W. Brown, director of the division.

On the staff of the division's materials and equipment requirements branch are Charles W. Cornforth, Public Service Electric & Gas Co, and L. J. Workman, Bureau of Reclamation. Paul Hand, formerly of Bonneville, is in the materials control branch.

New members of the Power Supply Division's regional coordination branch (See EW, March 5, p 5 for regional assignments) are Iver Edstram, Commonwealth Edison Co, Region II; Thomas J. Williams, retired Ohio Edison Co official, Region III; and Ralph Shangraw, Rural Electrification Administration, Regions VII and VIII.

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New Reservoir Forming

The Colorado River below Hoover Dam will become a full-fledged reservoir around May 15 when Lake Mohave above Davis Dam backs up to the Hoover Plant tailrace in Black Canyon. The reservoir, which began forming a little more than a year ago, is expected to reach an elevation of 643 ft above sea level on that date. At this level the lake will extend 67 miles upstream to Hoover Dam and will contain about 1.7 million acre-ft.

YESLER SUBSTATION of Seattle City Light is taken out of service as Supt E. R. Hoffman (right) pulls the switch which will disconnect the last 2.5-kv feeder. Looking on is George L. Meagher (left) who helped build the substation before joining the department 46 years ago. A contractor's laborer then, he now is superintendent of shops, warehouses, and equipment and one of the department's three oldest employees in time of service. Also shown is W. J. Olson, power operations engineer, whose department headquarters will remain in the building

Clerks Restive, Others Satisfied in Transfer to Seattle City Light

Although only 25 persons lost their jobs, more than 100 of the 427 former Puget Sound Power & Light Co employees who transferred to Seattle City Light in a $25,850,000 property transfer felt the move was for the worse.

Most of the 100 were office workers who received wage cuts reportedly as much as $100 a month. Many of them also said they had been down-graded in the transfer. Part of the discontent may have arisen out of a union dispute, since Local 77, Electrical Workers' Union, AFL, had to relinquish collective-bargaining rights over office employees and Local 8, Office Employees' Union, was conducting a membership drive.

John Nelson, assistant superintendent of City Light, declared the transfer resulted in an over-all increase in pay, rather than a net loss, for Puget Power workers absorbed by the city system. He acknowledged office workers generally lost pay in the transfer but said their average loss was comparatively low. Time to reclassify new employes was "too short," he said, adding there may be some adjustment of job classifications and rehiring of workers who lost jobs in the transfer.

Most technical personnel appeared satisfied with the transfer, although some head groundmen, material men, and underground workers have been asked to take sizeable wage slashes. Linemen will get 2¢ an hour less than they did with the private company.

The 25 persons who lost their jobs included supervisors, outside salesmen, and clerical workers. They have received an average of nearly $5,000 each in severance pay from Puget Power on the following schedule: Four months' salary for persons with less than 10 years' service, eight months' salary for those with 10 to 20 years and one year's salary for those with 20 or more years of service. In addition, all employees affected received vacation and accrued sickleave pay.

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Resigns from State Body

Harold L. Barnard has resigned from the New Hampshire Public Service Commission because of ill health but has been retained as consulting commissioner for the remainder of his term, which expires in June 1953. Harold K. Davison has been appointed to the commission.

Federal Power Told to Step Aside

Investor-Owned Companies Point Out Adoption of Their Suggestions Would Save Taxpayers Money and Conserve Materials for Defense

There are two contrary and opposing power programs up for consideration before Congress. The one is the public power program which is part of the federal budget for fiscal 1952. The other is the program of the nation's investor-owned companies.

The former is the one that will get the newspaper headlines. It is the only one on which Congress will vote formally. Only by rejecting this public power program can Congress indirectly approve the plans of the private companies.

That the private companies are opposed to the federal power trust (the only power trust in the country) goes without saying. In addition to the ideological arguments given many times in the past the companies this year are presenting two other arguments: (1) Rejection of the public power program will cut the tax bill of every American. (2) Elimination of duplicating public power lines and facilities will save scarce materials and contribute to the defense mobilization program.

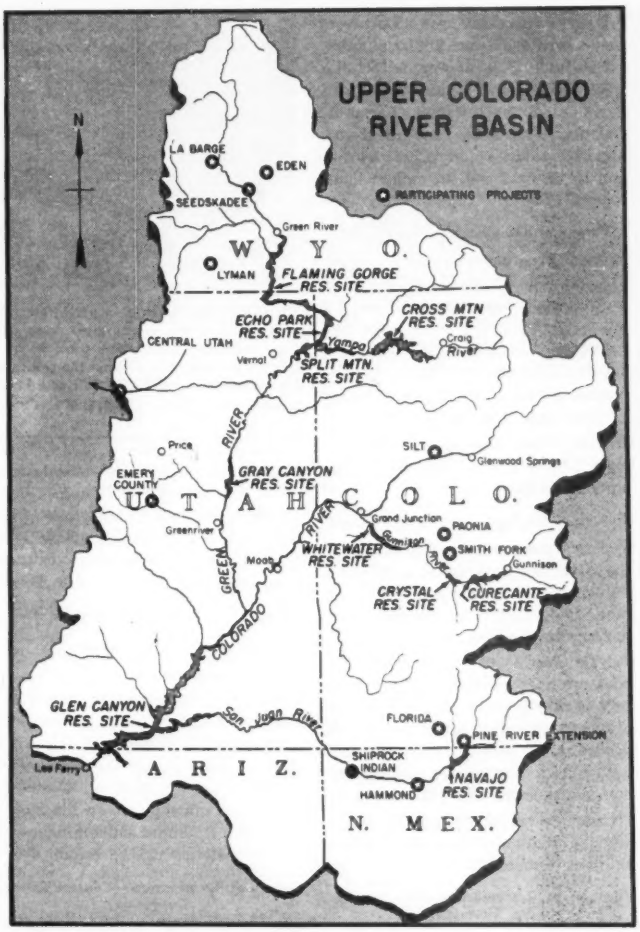
Here in brief are the programs contrasted:

Southeastern Power Administration

Federal Program—SPA wants $4.5 million. $4 million for transmission lines. $300,000 for operation and maintenance. $200,000 for a continuing fund. Lines would be built in Virginia, North and South Carolina, and Georgia. In future years $25.7 million would be needed to complete the so-called initial program.

Private Power—Area companies have offered to make power from federal multipurpose projects available to all people in area including preference customers. Companies would use own lines and build any others needed.

Private Power Savings — Taxpayers would save $6.3 million this year (some funds have been appropriated for fiscal 1951) and ultimately $31,570,000 on the initial program. Materials saved would include 31 million lb of steel, 11 million lb of aluminum, 15,000 wood poles, 221,000 insulators, and 2.8 million manhours of labor.



DEVELOPMENT of the Upper Colorado River Basin as foreseen by Interior Secretary Oscar L. Chapman is shown by the map. The plan of the Secretary, which would cost $1,139 million and would provide 1,622,000 kw of capacity in addition to irrigation benefits, has been sent to the five basin states for comment (EW, Feb. 12, p 90). Chapman proposes that Shiprock Indian Reclamation project (black dot) be authorized for construction and that it receive assistance from the Upper Colorado River account the same as other participating projects. This is only one of the many federal projects for which taxpayers will be asked to supply the cash

Southwestern Power Administration

Federal Program—SPA is asking $4.1 million for lines—$2,535,000 for lines under construction and $1,565,000 for new construction. Another $2,367,131 will be needed later to complete the 1952 program.

Private Power—Empire District Electric Co, Joplin, Mo., opposes use of $1,560,600 for building lines in Mis-

souri as well as expenditures of $2,936,000 previously appropriated for the same lines. Companies of the area also oppose use of $300,000 permanent continuing fund to lease and acquire lines built by REA co-ops. Empire State is willing to "wheel" power but says SPA isn't interested.

Private Power Savings — Taxpayers would eventually save $66 million because Interior is hoping to acquire 3,480 miles of lines and 115,000 kw of steam plant capacity in Arkansas, Oklahoma, Kansas, and Missouri. Materials saved would include 44 million lb of steel and 33 million lb of copper.

Bureau of Reclamation—Iowa Lines

Federal Program—Bureau is asking $18,709,640 for its Missouri River project line construction program. Of this $894,000 is asked to begin line construction in Iowa which would ultimately cost over $30 million.

Private Power — Companies oppose any lines east of Sioux City.

Private Power Savings — Ultimately close to $30 million and unestimated amounts of materials.

Bureau of Reclamation—Montana Lines

Federal Program—For this portion of the Missouri River project program bureau is asking $2,351,450 with another $4,456,532 to be requested later to complete the work.

Private Power—Montana Power Co contends lines aren't needed. It is now serving all co-ops to be served by the proposed lines with power at 5.5 mills per kwhr, the bureau rate. Company has contract to "wheel" power to preference customers of the government.

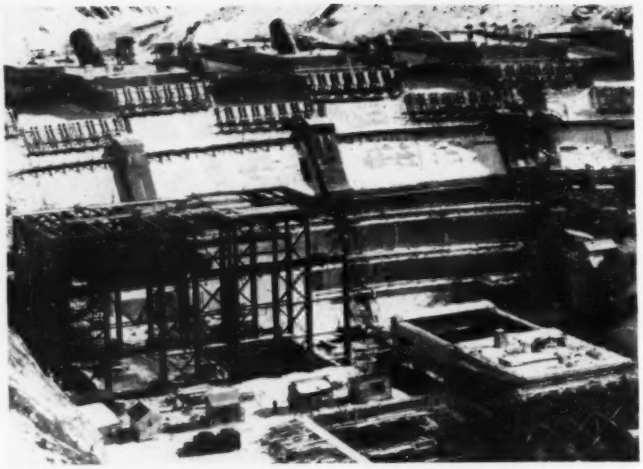
Private Power Savings—The entire amount requested and unestimated amounts of materials.

Bureau of Reclamation—Colorado—Big Thompson

Federal Program — Bureau requests $19.3 million, including funds for generation, a 115-kv line between Estes and Leyner, and some substations.

Private Power—Public Service Co of Colorado proposes that the government instead build a shorter line, one smaller substation, and an addition to another. It would build some line and add to one of its substations.

Private Power Savings — Taxpayers would save $330,000 and 18 miles of conductor.



HUNGRY HORSE DAM in northwestern Montana, still blanketed by ice and snow, is being readied for a record-breaking construction year. The first project will be to clear the tops of all concrete blocks of 6 in. of wood shavings, which were applied last fall as insulation against the severe cold. Major work scheduled this year includes placement of about 1,200,000 cu yd of concrete and construction of the 285,000-kw powerhouse. Pouring will begin soon. Four 105,000-hp turbines will be installed

Bureau of Reclamation—Minadoka Project, Idaho

Federal Program—Bureau asks $1.3 million to start work on a 30,000-kw plant on the Snake below the existing American Falls Plant of Idaho Power Co. Ultimate cost would be $6.6 million.

Private Power — Idaho Power will build all lines needed.

Private Power Savings—Company asserts government plant would only supplant its 27,000-kw station since there is water enough for economical operation of only one plant. Company is building other plants on the Snake at lower cost. Entire amount requested and all materials can be saved.

Bureau of Reclamation—Central Valley, California

Federal Program—Bureau is asking $5.5 million for lines, another $19.2 million will be needed later.

Private Power—Pacific Gas & Electric Co is willing to assume responsibility for power supply in area.

Private Power Savings—Entire amount asked.

Bonneville Power Administration—Eastern Oregon

Federal Program—BPA is asking $1.6 million for a line from La Grande to Baker, Ore., for survey work, and for continuation of construction of the McNary Dam-La Grande line. The latter line though authorized is not under construction.

Private Power—California-Pacific Utilities Co, Baker, says line from McNary through to Baker is unnecessary at present time.

Private Power Savings — Ultimately about $6 million and unestimated amounts of materials.

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Truman to Push Policy Based on WRPC Report

President Truman has begun a review of federal water programs based on recommendations of his Water Resources Policy Commission. Budget Director Frederick J. Lawton was named to coordinate the new activity.

"It is my intention," the President said, "after careful review of the report and recommendations, to take such administrative actions and to submit to Congress such legislative recommendations as seem appropriate from time to time."

The Presidential comment came in letters sent to the Secretaries of Defense, Interior, Agriculture, and Commerce; the chairman of the Federal Power Commission; and the administrator of the Federal Security Agency.

Arsenal Economy Is on the Way, Col Chevalier Tells NEMA Meeting

This is a transition period and not an emergency, Col Willard Chevalier, executive vice president, McGraw-Hill Publishing Co, told the luncheon meeting of the National Electrical Manufacturers Association convention at Chicago on March 14.

The transition period, Colonel Chevalier said, is that period of change from peacetime economy Americans had always known to the arsenal economy known to the countries of Europe in the years preceding World War II. The arsenal economy, he said, can be expected to prevail for many years, as long as most of those present were in business.

COL WILLARD CHEVALIER, executive vice president, McGraw-Hill Publishing Co, left, chats with C. W. Higbee, NEMA president, at the convention in Chicago. Chevalier was speaker at luncheon

Reviews Materials Situation

Reviewing the materials situation Colonel Chevalier said:

Cut back in consumer goods requiring copper will not be more than 60%, excepting only the frivolous area.

Peak military needs and defense-essential industry will not take more than one third of the steel output. The steel supply will be expanded rapidly from 105 million tons a year now to 120 million tons a year in 1953.

Nickel-chrome resistance elements will present a special problem. Chrome will be tight, nickel tighter. Wise administration should permit something like half the normal supply of nickel-chrome resistance elements.

Aluminum Outlook Brighter

Aluminum presents a brighter picture because of increased production capacity. Aluminum for civilian uses not classified as frivolous, it appears, will not be cut back more than 40%.

Cobalt will be put practically out of reach of civilian consumption for the next two years by military requirements.

Tungsten requirements went up fivefold during the past year. However, with increased production at a price, and reasonable conservation, necessary requirements for lamp filaments will be met.

Increase in synthetic rubber production together with reasonable conservation, should maintain the rubber supply. Production limitations will be dictated by copper and steel, which will be in shorter supply than rubber.

Technical manpower is already in short supply, the colonel said. "If, on top of this shortage, the armed services make deep inroads into the supply of technical graduates . . . not only the general wellbeing, but also the long-range defense effort itself will be injured, perhaps seriously."

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Korean-Power-Plant Wrecker Back in U. S.

A civilian electrical engineer who put two Korean power plants out of commission in the path of onrushing Communist forces has been brought to the Bethesda Naval Hospital near Washington to recuperate from injuries.

The wounded engineer is Joseph H. Moore, a 31-year-old employee of the Economic Cooperation Administration.

On New Year's Day, Moore led a small force north of Seoul through retreating United Nations forces to power plants at Chungpyung, 35 miles north of the South Korean capital. Equipment and essential parts from the plants badly needed in South Korea were evacuated, but Moore's truck plunged off a slippery road and he sustained serious hip injuries on the return trip.

The power plants which the Communists seized will be out of action for many months, and scarce equipment is now held by the UN troops.

Excavation Lag Delays Seattle Plant on Skagit

Delay in excavation for its $25-million Ross Plant on the Skagit River has led Seattle City Light to abandon hopes of getting power from the plant late next year. This may lead to a critical shortage should a low-water period ensue.

The Municipal Board of Public Works has ordered Peter Kiewit Sons' Co, excavation contractor, off the job, declaring it was far behind schedule and has included the uncompleted work in the powerhouse contract. Only one bid, about $14,690,000, has been received for the powerhouse, from Guy F. Atkinson Co, San Francisco.

In buying the Puget Sound Power & Light Co distribution system in the Seattle area, City Light took over a 200,000-kw load. The company agreed to sell City Light 83,500 kw for a two-year period, ending Feb. 28, 1953, the balance of the needed power to come from the Bonneville Power Administration, Tacoma City Light, and steam generation.

The first 90,000-kw generator in the Ross Plant had been scheduled to go on the line in November, 1952; the second in February, 1953; a third later in the year and a fourth sometime in the future. With the delay, this schedule probably cannot be met.

Every month's delay in completion of the powerhouse would cause City Light to lose at least $400,000 revenue from the sale of power, according to E. R. Hoffman, City Light superintendent. The delay may be as long as four months, he estimated.

The Kiewit company has objected to City Light allegations that it is to blame for the excavation delays. It has told the Board of Public Works it may file claims of $500,000 against the city, asserting it was "repeatedly" furnished with "changed and erroneous drawings" and changes in the work to be done.

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To Build 5,000-Kw Plant

Narragansett Electric Co, subsidiary of New England Electric System, will build a new diesel power plant at Westerly, R. I. The utility has ordered five 1,000-kw units which are expected to go into operation before the end of the year.

EMPLOYEES of Kansas Power & Light Co's Eureka division have completed 4,383 days without a lost time accident. An analysis of the payroll for the 18-man group reveals approximately 626,000 man-hours of work during the period, each of which was a safe hour. Weekly safety meetings are held at Eureka in an effort to preserve the record

Roundup of Techniques Presented Corrosion Engineers in New York

Controlled addition of ammonia to increase the pH of the feed water to about 9 reduces the solubility of both iron and copper, according to F. G. Straub and H. D. Ongman of the University of Illinois, who spoke at the annual meeting of the National Association of Corrosion Engineers in New York. This, they said, facilitates the protection of the metals in the power plant steam-water cycle.

Bare copper ground mats and rods at generating stations and substations tend to accentuate the corrosion vulnerability of other buried metals, said J. H. Collins and E. H. Thalmann of Ebasco Services. The cathodic protection indicated may require several hundred amperes of corrective current, they added.

Corrosion on underground components of rural electrification circuits is sometimes excessive, asserted O. W. Zastrow, Rural Electrification Administration. The common neutral system makes matters worse. High strength conductors occasionally corrode excessively under adverse conditions. Durability of transformer paints is being studied with a view to increasing useful life of the coatings.

Condition of galvanizing on tower legs underground can be estimated with fair accuracy by measurement of tower-to-soil potentials. The procedure is preferred at Detroit Edison Co, said W. J. Piper and J. D. Piper, to chemical or visual inspection. The potentials at line-section terminals are usually less than at mid-points and also where the towers are near steel poles set in concrete and grounded individually. Gradients are usually downward in the direction of the tower having the greatest deterioration of galvanizing.

Attention was called to plant apparatus corrosion during standby periods by L. Highley and W. R. Schnarrenberger, Hall Laboratories chemists. Protection for the turbine is partly prevention of steam in-leakage and siphoning action through drain lines, they pointed out.

At Dow Chemical's cyclone-fired pressurized boiler installation the amount of oxidation thickness is being determined by analyzing the samples drained from the unit after an acid cleaning, M. E. Brines and F. N. Alquist of that company explained.

The Spring Was Missing

Add to the troubles of rural utilities.

Seems that when the power went out at the western division of Arizona Edison Co at Yuma, H. H. Idle, district supervisor, found that some "lumberjack" deliberately had notched a tree so that it would fall on the power lines.

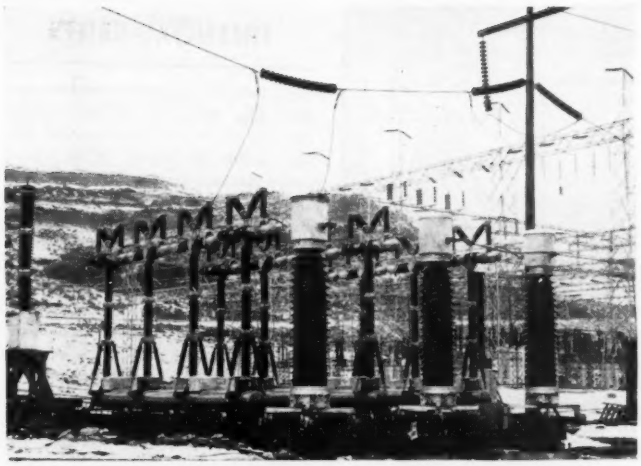
The culprit explained he thought the wires would "spring the tree right back to where he wanted it to fall."

Boiler Contract Awarded

A contract for four boilers for Electric Energy, Inc's 652,000-kw outdoor power station near Joppa, Ill., has been awarded to Combustion Engineering — Superheater, Inc. The boilers each will serve a single turbine-generator and will be designed to produce steam at 2,150 psi, 1,000 F/1,000 F. They will burn natural gas or pulverized coal, separately or in combination. When operating at full capacity with coal as fuel, the four boilers will burn 7,500 tons, 150 carloads, per day.

Plans 120,000-Kw Addition

Dayton Power & Light Co plans to construct a $15-million addition to its Miamisburg Plant south of Dayton, Ohio. A third section will be added to house two 60,000-kw generators. Four generators of this capacity are in operation there at present.



220-KV AIRBLAST CIRCUIT BREAKER that interrupted in 2½ cycles faults up to 11-million kva, 3-phase equivalent, in tests on Bonneville Power Administration system. Unit is to be installed at BPA's Columbia substation. Horizontal chambers atop each porcelain column contain two sets of fixed and movable contacts operated pneumatically at 225 psi and held open by air pressure. The Brown-Boveri breaker has no disconnect; mounts on ground. Tests were completed on March 18

Brown-Boveri Breaker Interrupts 11-Million Kva

Tests of a 220-kv, Brown-Boveri, airblast circuit breaker have proved that it is capable of interrupting in 2½ cycles faults up to 11-million kva, 3-phase equivalent. This is a value never before approached by air-breakers. The final tests were made Sunday, March 18, between midnight and 9 AM at Grand Coulee Dam powerhouse.

Earlier tests demonstrated the ability of the breaker to interrupt, without restrike, charging currents for lines up to 300 miles long.

Bureau of Reclamation and Bonneville Power Administration officials conducting the tests in conjunction with the Swiss manufacturer's representatives termed the results highly satisfactory.

The unit tested, which is rated 220 kv, 6,000 Mva symmetrical, 9,000 Mva asymmetrical interrupting duty, will now be installed in BPA's Columbia substation in central Washington to provide actual operating experience.

Four line-dropping and one line-charging tests were made on 100, 200, and 300 miles of single phase conductor between 2 AM and 6 AM, Wednesday, March 14. Single-phase line to ground interruptions for a series of arching faults and solid faults with and without reclosing were made on March 18. The last three of these interruptions were made with the maximum short circuit capacity of the Coulee Plant and the Northwest Power Pool, which is believed to be the largest concentration of power anywhere in the world.

The breaker interrupted the currents in each case within 2½ cycles after tripcoil energization without visible distress. Examination of one of the eight sets of fixed and movable contacts per pole immediately following the tests (removal time—6 minutes) disclosed signs of severe arching. However, there was no damage which would obviously interfere with further successful operation.

One major purpose of the tests, stated O. A. DeMuth, chief of BPA's branch of system design, was to demonstrate operating characteristics of the breaker to about 100 representatives of the American electrical industry. Both he and C. L. Killgore, electrical engineer from the Bureau of Reclamation's Denver office, indicated a desire to stimulate American manufacturers to investigate further development of circuit breakers embodying some of the desirable characteristics of the airblast breaker.

Two breakers of the type tested, but rated 138 kv, 3,500 Mva symmetrical, have been purchased by Detroit Edison Co for installation in July of this year.

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Ohio Companies Form Electric Utility Institute

Ohio's nine principal electric power companies have announced formation of the Ohio Electric Utility Institute.

General objectives of the institute include interchange of information and ideas with respect to various problems of utility management and operation for the benefit of the industry in keeping it prepared to meet the constantly increasing demands of its customers and the power requirements of the nation's rearmament program.

Charter members are: Central Ohio Light & Power Co, Cincinnati Gas & Electric Co, Cleveland Electric Illuminating Co, Columbus & Southern Ohio Electric Co, Dayton Power & Light Co, Ohio Edison Co, Ohio Power Co, Toledo Edison Co, and Marietta Electric Co.

The institute's 1951 officers are: President, Harold Turner, Canton, vice president and general manager of Ohio Power Co; vice president, R. E. Burger, Akron, chairman of the executive committee of Ohio Edison Co; treasurer, H. C. Vincent, Columbus, vice president and treasurer of Columbus & Southern Ohio Electric Co.

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Quits Arizona Board

The public vs private power controversy is reported the basis for the resignation of Michael J. Dougherty as chairman of the Arizona Power Authority. Dougherty has been outspoken in favor of public power. Arizona's new Republican governor, Howard Pyle, favors private power. The Arizona Power Authority is the state agency for distribution of Colorado River power. Dougherty has served as authority chairman since 1944 when the agency was set up.

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Orders Third Generator

Detroit Edison Co has ordered a third 125,000-kw turbogenerator for its new St. Clair generating station on the St. Clair River between Marine City and St. Clair.

YIELDS (%) — Operating Electric Utility Securities

Quality	Bonds			Preferred Stocks			Common Stocks		
	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd
Date									
1951									
Mar. 15	**2.84**	**2.87**	**2.93**	**3.89**	**4.09**	**4.49**	**5.45**	**6.20**	**7.06**
Mar. 8	2.79	2.81	2.89	3.84	4.07	4.46	5.39	6.02	6.80
END OF QTR.									
4th 1950	2.65	2.67	2.78	3.86	4.14	4.51	5.80	6.54	7.44
3rd 1950	2.66	2.67	2.76	3.81	4.08	4.46	5.70	6.54	7.25
2nd 1950	2.68	2.66	2.74	3.79	4.03	4.38	5.38	6.51	7.50
1st 1950	2.59	2.61	2.74	3.78	4.01	4.36	5.22	5.85	6.67

Data: Reis & Chandler, Inc.

Electric utility bond yields have reached their highest point since Nov. 8, 1948. On that date and on March 15 of this year first quality bond yields stood at 2.84%. Second and third quality bond yields were 2.94% and 3.03% respectively for Nov. 8, 1948. On March 15 yields for these classes of bonds had not quite reached these high levels. They were 2.87% for second quality and 2.93% for third.

The rise of utility bond yields followed on the heels of the rise in government bond yields. Government bonds began selling under par earlier this month for the first time since 1939, offering serious competition to corporation bonds.

There has been no major new utility bond issue offered since the break, but its effect is reflected in a drop in the price of Consolidated Edison Co of New York's bonds put up for sale on Feb. 27. The bonds were offered at 101.994% and went above that price shortly afterwards. However, after the break in the government bond market they dropped to 101.25%.

Preferred stock yields have followed the same trend as bond yields but to a much slighter extent.

Pepco Gets Rate Boost of $2.6 Million Annually

Potomac Electric Power Co has been granted a $2.6-million-a-year rate boost by the District of Columbia Public Utilities Commission. The utility had asked for an increase of $3.5 million.

Capital Transit Co and the district's street lighting will bear a smaller proportion of the increase than Pepco had proposed. The utility had asked for $697,000 a year more, a 58.7% increase, for street lighting, and $514,000 and $43,000, or 57.8% and 93.5%, respectively, for dc and ac street railways. The commission allowed a $265,000 boost for street lighting and a total $230,000 increase for Capital Transit. Under the commission's finding the burden would fall more heavily on residential customers.

The commission also turned down Pepco's analysis based on dollar needs required to maintain a sound financial position and substituted the "conventional method" of a fair rate of return. The utility estimated its construction expenditures through 1954 at almost $80 million, allowing for a 5-10% increase in the general price level. Earnings as of Dec. 31, 1951, would be only about $1 a share after further planned dilution of common stock if rates were based on a 5½% return, the company estimated. It asked for an $8.7-million gross income for the year ending June 30, 1951, to service existing securities and permit sale of others. The PUC rejected this reasoning, finding a 5½% return on the rate base sufficient to provide a "fair return" on equity capital. Pepco reported earnings at less than 5% in 1950.

FINANCIAL BRIEFS

Light bills took a nosedive in Jacksonville, Fla., when the city cut electric rates by 7½% and then repealed the 10% utility tax passed as an emergency measure in 1947. The rate cut, affecting residential and commercial customers both inside and outside the city limits, will save them about $400,000 this year and $500,000 in future years. Repeal of the tax, levied on electric, water, gas, and telephone services within Jacksonville, will save consumers more than $1.3 million annually. A similar tax also was abolished by Hialeah, cutting $9,000 to $11,000 a month from the city's revenues.

Kansas Gas & Electric Co, has asked Public Service Commission permission to sell transmission and distribution lines in Jasper and Barton counties as the final step in dismantling its Missouri facilities. The company began disposing of its electric utility service in Missouri last July.

Manufacturers in Kentucky must use two meters to avoid the state's 3% tax on bills for power and gas, the state Court of Appeals has ruled. The tax law exempts utilities used for manufacturing from the levy, but to take advantage of this exemption companies must separate electric power and gas actually used in processing from that used for general purposes.

Martinsville, Va., City Council has cut residential electric rates 8% and commercial rates 29% to meet the schedule of nearby Appalachian Electric Power Co. Residential users will save about $19,000 annually and commercial consumers $22,000.

Electric Utility Financing—March 10-17

Company	Description	Amount of Offering (000)	Offering Price	Yield at Price to Public
Bonds				
Lake Superior District Power	1st mtg. "D" 3¼s, 1981, new money	$2,000	101.931%	3.15%
Common Stock				
Pacific Gas & Electric	1,419,562 sh, new money	44,006	$31.00	6.45

SCHEDULED FOR FOLLOWING WEEK

Preferred Stock—New Hampshire Electric, 15,000 sh $4.50 ($100 par), $1.5 million, proceeds to New England Gas & Electric; Pennsylvania Power, 40,000 sh ($100 par), new money, $4 million; Central Illinois Electric & Gas, 25,000 sh ($100 par), new money, $2.5 million.

Common Stock—New Hampshire Electric, 40,000 sh, proceeds to New England Gas & Electric, $2.5 million; Carolina Power & Light, 200,000 sh, new money, $6 million; Middle South Utilities, 450,000 sh, new money, $8 million.

MEETINGS

Protective Relay Engineers
Annual Conference, Agricultural & Mechanical College of Texas, College Station, Texas, March 26-28.

Oklahoma Utilities Association
Annual Convention, Mayo Hotel, Tulsa, Oklahoma, March. 29-30.

Southeastern Electric Exchange
Engineering and Operation Section, Vinoy Park Hotel, St. Petersburg, Fla., March 29-30; Annual Conference, Boca Raton, Fla., April 11-13.

★Tennessee Valley Public Power Association
Annual Meeting, Knoxville, Tenn., March 30-31.

Edison Electric Institute
Annual Sales Conference, Edgewater Beach Hotel, Chicago, April 2-5; Transportation Committee, jointly with American Gas Association Motor Vehicle Committee, Peabody Hotel, Memphis, Tenn., April 16-18; Purchasing and Stores Committee Annual Conference, Lord Baltimore Hotel, Baltimore, Md., April 30-May 2; Transmission and Distribution Committee, Edgewater Beach Hotel, Chicago, May 1-2; Meter and Service Committee, jointly with Association of Edison Illuminating Companies' Committee on Metering and Service Methods, Huntington Hotel, Pasadena, Calif., May 7-9; Commercial Electric Cooking Conference, Sheraton Hotel, Chicago, Ill., May 9; EEI Accident Prevention Committee, Hotel Utah, Salt Lake City, Utah, May 21-22; Electrical Equipment Committee, Hotel Biltmore, Los Angeles, Calif., May 28-29; Annual Convention, Shirley Savoy Hotel, Cosmopolitan Hotel, Denver, Colo., June 4-7.

American Society of Mechanical Engineers
Spring Meeting, Atlanta Biltmore Hotel, Atlanta, Ga., April 2-5; Semi-Annual Meeting, Royal York Hotel, Toronto, Canada, June 11-15.

Electric Association of Chicago
Industrial Electrical Exposition, Sherman Hotel, Chicago, Ill., April 3-6.

Midwest Power Conference
Sherman Hotel, Chicago, April 4-6.

Missouri Valley Electric Association
Engineering Conference, President Hotel, Kansas City, Mo., April 4-6; Accounting Conference, President Hotel, Kansas City, Mo., May 17-18.

★Illuminating Engineering Society
Southern Regional Conference, Atlantis Hotel, Miami Beach, Fla., April 9-10.

Indiana Electric Association
Young Men's Utility Conference, Ipalco Hall, Indianapolis, April 10-11.

American Institute of Electric Engineers
District No. 4 Meeting, McFadden-Deauville Hotel, Miami, Fla., April 11-13; District No. 1 Meeting, Hotel Syracuse, Syracuse, N. Y., May 2-4; District No. 5 Meeting, Loraine Hotel, Madison, Wis., May 17-19; Summer General Meeting, Royal York Hotel, Toronto, Canada, June 25-29.

Northwest Public Power Association
Annual Convention, Cascadian Hotel, Wenatchee, Wash., April 12-14.

Rocky Mountain Electrical League
Annual Spring Conference, Shirley Savoy Hotel, Denver, Colo., April 15-18.

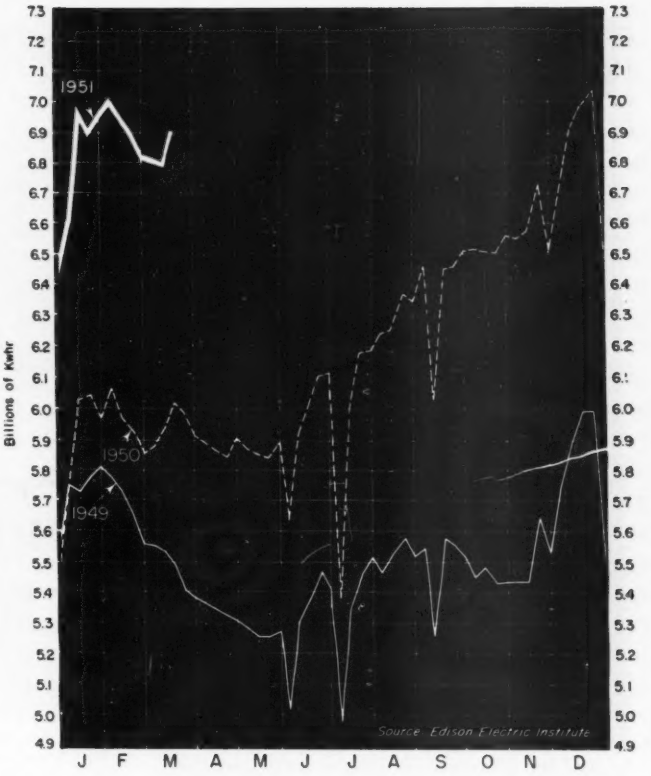
★Michigan Municipal Utilities Association
Spring Meeting, Wenonah Hotel, Bay City, Mich., April 19-20.

Northwest Electric Light & Power Association
Engineering Section, Hotel Utah, Salt Lake City, Utah, April 25-27; Business Development Section, Multnomah Hotel, Portland, Ore., May 7-9; Personnel Section, Davenport Hotel, Spokane, Wash., May 16-8.

Pennsylvania Electric Association
Communications Committee, Bedford Springs Hotel, Bedford, Pa., May 3-4; Joint Meeting of Electrical Equipment, Transmission and Distribution Committees, Abraham Lincoln Hotel, Reading, Pa., May 10-11.

New Jersey Utilities Association
Spring Meeting, Seaview Country Club, Absecon, N. J., May 4.

American Public Power Association
Annual Convention, Read House, Chattanooga, Tenn., May 7-9.



Output Week Ended March 17—6,903,264,000 Kwhr

Weekly Output, Millions Kwhr

1951		1950		1949	
Mar	17 6,903	Mar	18 6,015	Mar	19 5,496
Mar	10 6,795	Mar	11 5,937	Mar	12 5,531
Mar	3 6,822	Mar	4 5,879	Mar	5 5,552
Feb	24 6,833	Feb	25 5,854	Feb	26 5,559
Feb	17 6,905	Feb	18 5,931	Feb	19 5,650
Feb	10 6,957	Feb	11 5,971	Feb	12 5,722
Feb	3 7,099	Feb	4 6,062	Feb	5 5,778
Jan	27 6,970	Jan	28 5,972	Jan	29 5,810
Jan	20 6,909	Jan	21 6,041	Jan	22 5,769
Jan	13 6,981	Jan	14 6,029	Jan	15 5,727

Percent Change from Previous Year

	Mar 17	Mar 10	Mar 3
New England	+13.8	+10.5	+ 8.8
Mid-Atlantic	+13.0	+12.2	+11.8
Central Industrial	+16.8	+15.9	+21.2
West Central	+13.3	+14.1	+13.7
Southeast	+16.3	+12.5	+11.9
South Central	+21.1	+23.7	+23.6
Rocky Mountain	+ 8.5	+10.6	+12.6
Pacific Coast	+11.8	+16.2	+19.7
Total United States	+14.8	+14.5	+16.0

New York Society of Professional Engineers
Engineering Industries Exposition, Hotel Statler, New York, May 10-12.

Public Utilities Advertising Association
Annual Meeting, Hotel New Yorker, New York, May 17-19.

Protective Relay Engineers
Annual Conference, Georgia Institute of Technology, Atlanta, Ga., May 18-19.

Missouri Association of Public Utilities
Annual Convention, Jefferson Hotel, St. Louis, Mo., May 21-23.

Pacific Coast Electrical Association
Annual Convention, Biltmore Hotel, Los Angeles, Calif., May 21-23.

Canadian Electrical Association
Annual Convention, Algonquin Hotel, St. Andrews, New Brunswick, June 18-20.

American Society for Testing Materials
Annual Meeting, Chalfonte-Haddon Hall, Atlantic City, N. J., June 18-22.

★ Addition this week

Municipal Is Purchased

Columbus & Southern Ohio Electric Co has purchased the Nelsonville municipal plant for $111,000. Customers of the plant have been transferred to lines of the purchasing company. The municipal distribution system will be reconstructed as soon as materials are available, but the plant will be dismantled.

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To Head Commission

Commissioner Carl W. Reed has been elected chairman of the Iowa State Commerce Commission.

WASHINGTON COMMENT

RONALD D. ROSS

The fact that federal power's foremost advocate, Secretary of the Interior Oscar L. Chapman, is actually in command of the electric utilities' mobilization program had been pretty well put aside if not forgotten. An able industry man, C. B. McManus, is administrator of the Defense Electric Power Administration, and Depa appeared to be operating slowly and quietly in relative harmony. This pleasant, though unrealistic, dream was shattered on March 1. The rude awakening was a pair of memoranda from Secretary Chapman to Administrator McManus.

"In planning the expansion of defense industries, the location of which is dependent upon power supplies," Depa was told, "it will be our basic assumption during the emergency period and until new capacity can be added that median or probable water conditions shall be used to determine the power resources available for new industrial expansion." Thus Chapman told McManus and his Depa staff what their policy would be on "power for defense industries."

Chapman Shows Who Is the Boss

In his policy memorandum on "power for defense industry in the Pacific Northwest" Chapman made it even more clear that he was the boss. "I have decided" that "I am justified in assuming a calculated risk on power supply in the Pacific Northwest by approving expansion of defense industries based on power supplies available during the next few years under median-year water conditions," Chapman declared. The Pacific Northwest policy is set forth in the first person with "I" or "my" in every sentence.

The relatively brief policy statements leave important questions unanswered. Even Chapman concedes that expecting water conditions to be median or better is a "calculated risk." There is no consideration at all given to alternatives in power planning, for example Southwestern gas generation vs Columbia hydro for aluminum. Is it strategically desirable to concentrate even more aluminum production on the Columbia? Will more aluminum potlines help develop and diversify the region's economy? These important questions are answered only by implication in the policy pronouncements.

Who Sets Policy Important to Industry

More important to most of the electric utility industry at this point, however, is not what these policies are but who made them. So long as Depa is in the Department of Interior, Secretary Chapman can and will write mobilization power policy.

Perhaps the clearest statement on this score is the final sentence of Chapman's defense power memorandum to McManus. "Please collaborate with the Defense Minerals administrator and the Assistant Secretary for water and power in effectuating the foregoing policy," Chapman requests. Assistant Secretary Warne is the well-known federal power spokesman for the department, while the Defense Minerals administrator is James Boyd, who also happens to be a member of Chapman's regular team in his other post as head of the Bureau of Mines. A newer member of the "team" is the Defense Electric Power administrator.

This does not mean that McManus and his private electric utility associates in Depa have adopted the federal power program of the department. Nor does it indicate anything in any way improper on Chapman's part. It's simply that Depa is an agency of the Department of the Interior. As Secretary, Chapman must set the policies of the department, and Depa must conform to them.

This is something less than a satisfactory arrangement for the electric utility industry. It will grow more and more distasteful as federal power's Mr Chapman writes more and more mobilization power policy. The industry must either wage a successful fight to have electric power controls taken out of the Interior Department or find itself increasingly subject to the policies established by Secretary Chapman.

TECHNICAL NOTES

ARCHER E. KNOWLTON

Crossarms of aluminum alloy have been installed on 21 towers of a transmission line to avoid necessity for line shutdown to permit protective painting otherwise required.

Wind power (aerogenerator) designs have been made in Germany for 14,000 and 20,000 kw; neither project has reached the development stage.

Uniformly distributed load probably exists on no actual feeder, but it is the most logical condition to assume for design analysis until facts permit more justifiable assumption.

Permanent magnet materials have been greatly improved primarily because of Japanese government sponsored researches of Honda on cobalt steel and of Mishima on Alnico.

Field tests of insulation condition have cost one company less than $10 a piece over a 13-year period embracing more than 15,000 tests.

Secondary mains of 300 Mcm (paper-lead) are successfully burned clear by one company without limiters, others deem them necessary.

Lead is increasingly expensive to use for secondary cable mains; the turn is toward non-leaded and synthetic coverings, particularly those trusted as impervious to moisture.

Operators can permissibly watch frequency go all the way to zero in the absence of adequate information and specific instructions.

Corrosion has been estimated to take an annual toll of 5½ billion dollars in this country.

TO GANG UP on the sales manager and put him into cold-storage is apparent purpose of this meeting. At the head of the table is Harlow W. Cash, president of the utility. At his left are Albert C. Vector, chief engineer, and intended victim George E. Sellers. At his right are Edward H. Byers, purchasing agent, and Oscar K. Watt, superintendent of power plants

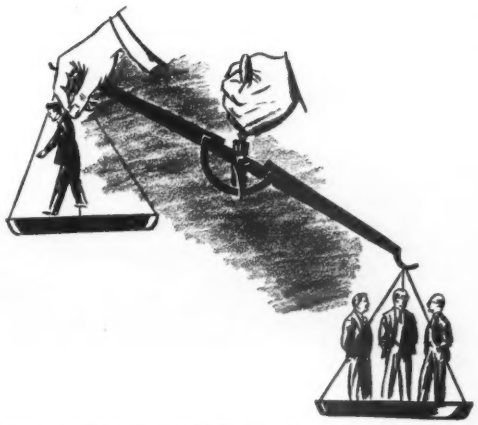
Mr. Sellers States the Case for Selling

Though conditions are tightening up, significant relaxation of sales efforts is not yet justified

The sales manager was on the carpet. Not for anything he had or had not done, but for what he might do if his wings were not clipped. And it looked as though he'd lose quite a few feathers. But he didn't, as will be seen.

By the merest chance, it happened that the editors of "Electrical World," disguised as scrub-women, had visited the office of the president the night before and installed a microphone behind one of the power plant pictures on the wall. No effort was made to conceal the tape recorder connected to the mike. It was placed in plain view on top of the bookcase below the picture on the theory of Poe's "Purloined Letter" that the obvious thing is never seen.

Present at the meeting the next morning were the president, Harlow P. Cash; the chief engineer, Albert C. Vector; the superintendent of power plants, Oscar K. Watt; the purchasing agent, Edward H. Byers; the sales manager, George E. Sellers. Transcribed from the tape, here is the

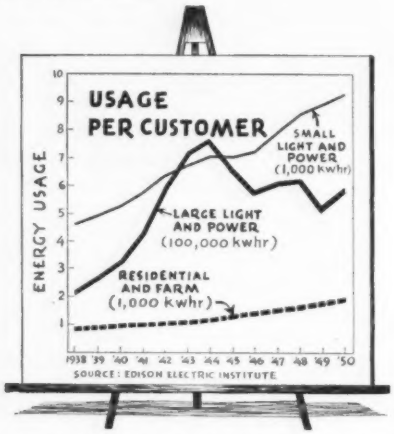


WILL SELLERS' ARGUMENTS outweigh those of the others? This is the problem facing President Cash

record of the meeting:

CASH Well boys, here we go again, maybe. Possibly another round of what we thought we were finished with five years ago. What is our company doing to be ready for what may come?

WATT Far as generating capacity is concerned, we're not too bad off. Number three at Slippery Creek goes on the line next month. The first unit for the new plant as Slabsides is ordered and ground will be broken next week. That ought to be running early in 1953. I wish we had a little more reserve right now, but we can get along all right unless the load piles up too fast.


USAGE
PER CUSTOMER
ENERGY USAGE
SMALL LIGHT AND POWER (1,000 kwhr)
LARGE LIGHT AND POWER (100,000 kwhr)
RESIDENTIAL AND FARM (1,000 kwhr)
1938 '39 '40 '41 '42 '43 '44 '45 '46 '47 '48 '49 '50
SOURCE: EDISON ELECTRIC INSTITUTE

CASH That's what I am afraid of, Oscar. It's the reason I called you fellows in here this morning. Look at this chart. It shows the average annual energy uses of residential and farm, and large and small light and power customers. You see that the average residential and farm customer used 1,935 kwhr last year, up from 1,342 in 1945. And the usage of the commercial customer is climbing pretty fast too. From this 12-year chart you can't tell what industrial customer usage will do. But the curve shot up fast when we got into the last war and it certainly will do that again if actual shooting starts. In view of that possibility, it seems to me we ought to lay off on load building.

SELLERS You never were so right, boss. As sales manager, I say, "Let's lay off load building." And in the same breath I say, "Let's keep on selling."

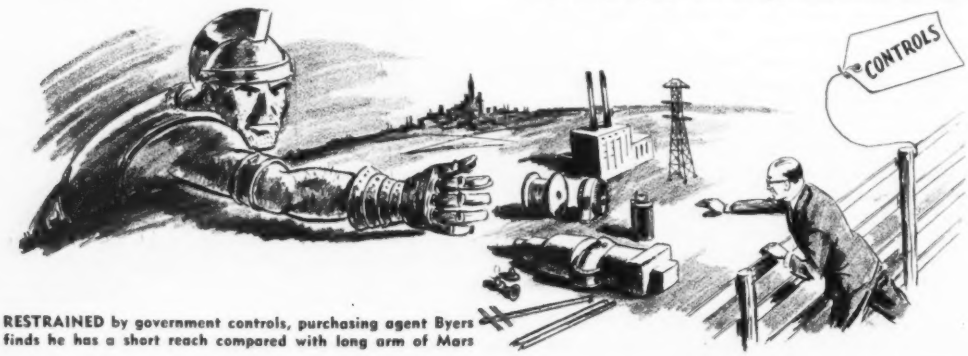
BYERS Now, now George, stop trying to kid us! Lay off load building and keep on selling! It doesn't make sense!

SELLERS It does to me, and I can prove it.

BYERS You'll have to do a lot of proving. What are you going to sell? Domestic appliance production is being cut back by restrictions on metals and the volume that is produced won't have to be sold. People will fall all over themselves in the rush to buy.

SELLERS It's exactly what happened last year that convinces me we'll have to sell the appliances that are made this year. I have a chart, too, in fact, three of them. Here's the first one.

It shows retail dollars the public paid for domestic appliances before and after the war. I agree with you that radio and television, particularly television, don't have to be sold, not in the sense of public acceptance. All of the full-page ads, trial offers and what not are not selling television. They are selling products—makers competing for larger shares of the market. But this is not true of electric appliances and the differences in the shapes of the curves on the chart prove it. The radio and television curve keeps right on going up. But the appliance curve does not.

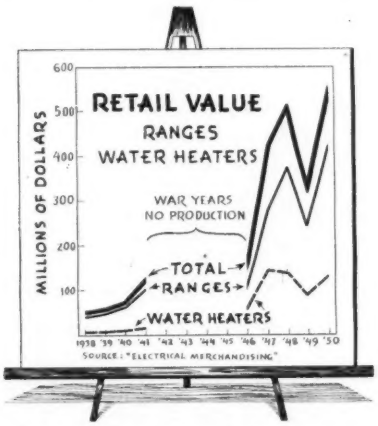


RESTRAINED by government controls, purchasing agent Byers finds he has a short reach compared with long arm of Mars

it rose rapidly in 1947. That was caused by the release of demand pent up in the war years. It continued to rise in 1948, but not so fast.

Look what happened in 1949. Appliance buying dropped nearly a billion dollars. In the sense of public acceptance the curve from 1946 to 1950 shows buying only. It includes darn little selling on the part of the electric utilities or the retail outlets. That's the reason the curve dropped in 1949. It was all buying, no selling, or hardly any. The appliance dealers were not selling because most of them didn't know how and the rest had forgotten. They were just enjoying a juicy post-war market which began to peter out. The electric utilities were not selling, not as much as they should have been, because they were still reconstituting and training their sales forces which had been allowed to disintegrate in the war years. In 1949 we had one person employed in residential sales work per 5,400 customers and we should have had one per 2,900 at most.* Actually we had fewer people in residential sales work in 1949 than we had in 1940 when we had fewer customers and less to sell.

Now, see what happened in 1950. The curve shoots up again. There were two causes for this. One was that selling began to get going. But mostly the cause was scare buying—get it while you can. People remembered the war years and were afraid there wouldn't be any appliances if war came.



This next chart of retail dollar sales of electric ranges and water heaters tells pretty much the same story—a big drop in 1949. But there is a difference and it's very important. Sales of all appliances dropped 20% in 1949 from 1948, but sales of ranges and water heaters dropped 37%. You must conclude that sales of these two appliances dropped farther and faster because they were lacking in public acceptance and the selling effort just wasn't strong enough to hold their sales up to the general level.

You all know, or you should because I've been preaching it to you for years, that the range and water heater are the foundation stones of the electrical home. Get them accepted and the rest is easy.

* "Electrical World," March 27, 1950, page 89.

IN HIS MIND'S EYE, Engineer Vector sees his men in uniform, subject to instant call from their important work

We simply can't afford to let up on promotion of them. If we do we're just writing off revenue for years to come. The gas boys are giving us plenty of competition, particularly LP, and they'd love to catch us with our guard down.

CASH That's a fine argument, George, and you put a heavy punch in it. But there are other things . . .

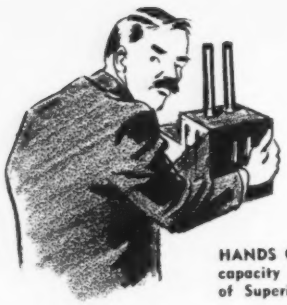
SELLERS Hey, wait a minute. I haven't finished . . .

CASH I know, I know. A good salesman is never finished. But running a power company includes more than selling. There are other matters, relatively unimportant of course, that we must give attention to—building new plant and raising the money for it, for instance.

VECTOR You hit me where I live, Harlow, when you mention building new plants. Raising the money is your problem and you can have it, but it isn't any tougher than mine. Oscar, there, would be more worried about capacity than he is if he knew what my department is faced with. It doesn't follow from major equipment being on order and ground being broken that Slabsides will go into operation in 1953, or ever. There's still a lot of detail engineering to be done and there was a time, and may be again, when the government says yes you ordered the stuff but you can't have it.

BYERS Not only that, but we're already running into difficulty with Slabsides. Reinforcing steel. It's ordered. But when will we get it? I don't know. Every time I check they give me a different excuse. Orders have been rescheduled and from fifth place in line we've been moved back to 29th. DO's crowding in. The mill is rolling shapes; maybe they'll get on bar production next month.

VECTOR Deliveries of steel are your worry, Ed, just as money is Harlow's. I want to talk about my troubles. It's manpower that bothers me most. Practically every young engineer I have is a reserve officer. I've lost two already; good men they were and no replacements in sight. If the others are



HANDS OFF my reserve capacity is the attitude of Superintendent Watt

called I'll be in a hell of a fix.

And that's not the only thing. If George keeps on shoving in ranges and water heaters all over the system, that means more copper and transformers for distribution. Where'll we get them? You know how copper is being doled out and I'm sure Ed here can speak with great feeling on the subject of transformer deliveries. Yes sir. I vote we throw a rope around George and hog-tie him so he can't make any more trouble for us.

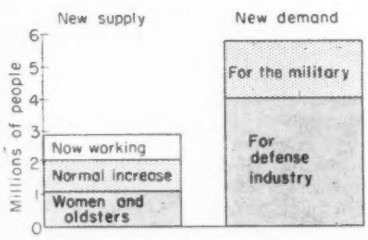
WATT Al, now you've got me worried, too. Like I said, we're not too bad off now for capacity with Number Three at Slippery Creek coming in next month. But I sure don't like what you and Ed are saying about Slabsides. So if the boss says the word, I'll hold George while you and Ed tie him up. So he can't cut our margin some more.

CASH Well, I guess that's it, George. Seems we can't afford to let you go on piling up load the way things look now. You see how it is.

SELLERS I'm darned if I do. You fellows are just seeing things in dark corners. We're a power and light company. Let's have a little light in those dark corners and maybe we'll see there's nothing there. Not very much yet anyway. I don't know for sure that war will come. Neither do you. I'm just as much afraid of it as you are. But for the Lord's sake, let's not scuttle into our holes until we are sure.

If we slack off on selling now we'll lose the work and money we've put into building up our sales organization since the war. And in spite of what the headlines say about cuts and controls and allocations we're going to have things to sell right up to the time the shooting starts, if it ever does. Take a look at my third chart, here. It shows the NEMA index of appliance billings by manufacturers by years from 1938 and by months in 1950. Appliance production in the first half of '51 may be cut to about 70% of the 1950 rate, according to what the manufacturers tell me. That is still a hell of a lot of appliances, more than we sold in 1949.

What's Ahead in Jobs, Housing, Power Sales, Income

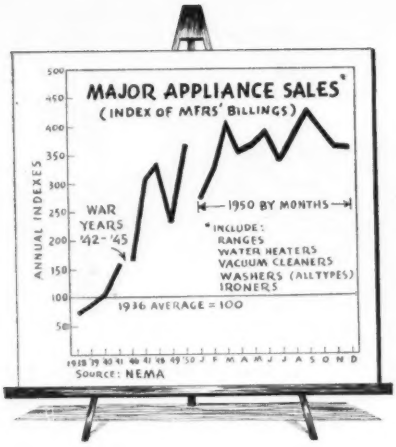


More Jobs Than Men

A manpower shortage looms as a major U. S. problem this year. The military services are expected to take about 1.8 million men during 1951, and defense industries will need about four million more—a total new demand for about 5.8 million persons. Usual sources of new workers and soldiers can't match this demand. Normal growth in the labor force is only one million a year, and the number of unemployed is close to what experts consider a peacetime minimum. The government expects a million or more new workers from the ranks of women and older workers —but the manpower deficit will still come to almost three million unless industry can attract more women and older workers than now seems likely.

Housing Down but Far from Out

Despite a barrage of orders intended to limit housing, builders are sailing ahead. They started more homes—87,000—in January than they did a year ago. And they have the financial commitments, and apparently the materials, to maintain starts at a relatively high level through the first half of the year. By midyear, however, the builders expect the Federal Reserve Board's Regulation X and the National Production Authority's cutbacks on metal to catch up on them. Their prospects for the second half of 1951 are geared largely to what the federal government will allow in the form of defense housing. Best guess—and all estimates are guesses at this point—is that 1951 will see 800,000 to 850,000 new permanent nonfarm homes started. That's the ceiling set by federal authorities—and they have the power to see that the industry stays within it. With the industry now being cut to little more than half its 1950 peak volume, prospects are that next year will see another cut of one-half. The number of starts may well drop to 400,000 in 1952.



They're talking about 850,000 new homes to be built in 1951. Every one of those new homes that is not equipped electrically, not wired adequately, is a sizable chunk of revenue lost for years to come. Are we going to lose it simply because we don't have the vision to see it and the ambition to pick it up?

Remember, Mr. Cash, this new capacity Al and Oscar are talking about is costing plenty of money. Remember, also, the chart you showed us with residential and commercial uses of energy steadily climbing up while industrial goes every which way. This means that residential and commercial revenues are more stable than industrial. For every dollar of industrial revenue we get over $2.50 from other customers.* Because you are afraid of the demand the up-and-down dollar customer may make you want to stop cultivating the steady $2.50 ones. I may be wrong, but I don't think that's the best way to get that expensive new capacity paid for.

CASH George, you certainly do get het up, don't you? I thought I knew your story before I called this meeting. I wanted these other fellows to get it, too. And, listening here, I find you have a much better argument than I realized. What do you say, Bill and Oscar and Ed, shall we let George alone, for a while anyway?

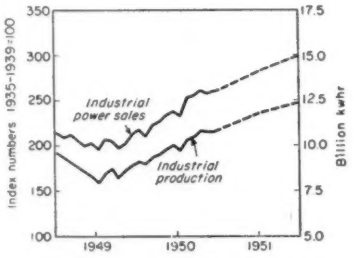
SELLERS Wait, wait. I haven't told my whole story. I don't just want to be let alone. I want more than that. And there's a fourth chart in my office.

CASH Let it stay there. It's past lunch time and you've told us enough, I think, to make an impression on these hardheads. So let's take the vote.

VECTOR Well, maybe we oughtn't to shoot him right now.

* 1950 industry average.

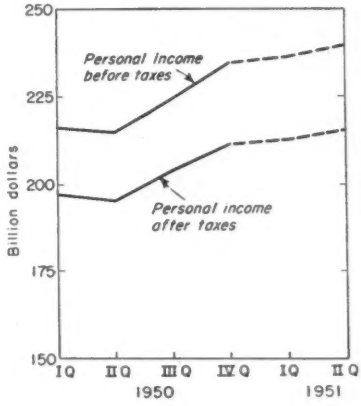
INDUSTRIAL POWER SALES AND PRODUCTION HEAD FOR NEW RECORDS



Mobilization Will Push Power Sales To a New High

The index of industrial production, as measured by the Federal Reserve Board, is currently running about 20% ahead of last year. By mid year it will be about 235 (1935-1939=100) a gain of about 7% above the current level. By the end of the year, it will probably hit a new record high of 250. (Peak production of 247 was reached during World War II). This indicates industrial production in 1951 will run ahead of 1950 by about 17% to 18%. Industrial power sales follows the pattern of industrial activity very closely. In 1950, when industrial activity rose 14% over 1949, industrial power sales gained 15%. So it appears that about 17% to 18% more power will be sold to industry in 1951 than in 1950. On this basis, industrial power sales have been projected from a level of above 13.0 billion kilowatt hours per month at the end of 1950 to 14.2 billion kwhr at mid-1951 and 14.9 billion kwhr by the end of the year.

THERE'LL BE MORE INCOME TO TAX



More Income To Tax

The current level of personal income is about $235 billion. This is slightly lower than it was in December, 1950, but is almost 10% above the level of the first quarter of 1950. With wages and salaries going up, most families will have more money to spend for the next six months at least. Then, maybe higher income taxes and increased excise taxes will slow down the demand for electric appliances. Appliance prices based on those included in the Bureau of Labor Statistics wholesale price index, have gone up about 4% over the January, 1950, level.

IN SPITE OF MARS peering over the horizon, **Sales Manager Sellers retains his clear vision of electrical living for the American home**

WATT As I said, we're not so bad off—let him go.

BYERS I'll put my handcuffs back in my pocket. But I think we should watch him.

CASH There you are, George. No hobbles on you yet, and never, I hope. As for the rest of your story, come and tell it to me tomorrow morning.

THE NEXT DAY

NEXT MORNING, the president hears the rest of the story

It was too bad the president did not call in the other men to hear what the sales manager had further to say. Because George still had a hatful of powerful argument and he brought up a matter that would have given them something to think about. It is to be hoped that they will read this report of what was heard by the tape recorder in the president's office next morning.

CASH Come in, George, come in. Oh, good morning, Mrs. Homec.

SELLERS I brought Mrs. Homec along with me because what I want to talk about is largely concerned with her home service department. But first I want to add a little to what I said yesterday.

CASH I guess you said plenty yesterday. It was enough anyway to hold Vector and Watt and Byers for a while. But go ahead. I want to get the whole picture.

SELLERS When we were talking about the volume of appliances that would be available this year, I had in mind to point out that cuts in materials for their manufacture do not necessarily mean equal cuts in production. I was talking to an appliance manufacturer a few days ago. He told me that the quantities of steel and copper and other controlled materials allowed for appliances could be stretched out considerably as the result of changes, small in themselves, but adding up to real importance. Designs and production methods are being intensively studied for more economical utilization of metals, for the employment of alternate materials, for reduction of waste, for reclamation of scarce metals from scrap, and for elimination of frills. And he spoke about "conversion" steel, which was new to me. A steel maker may have blast furnace capacity and converter equipment to produce more ingot steel than at the time he can roll in in his own mill. Most military requirements are for plates and other heavy stock. This will leave equipment for rolling thin sheets standing idle in some places. The users of sheets can buy this surplus ingot steel and contract the rolling of it. This conversion steel is and will be expensive but it is a way for the appliance manufacturer to obtain steel if he has trouble getting his full allotment from his regular suppliers.

CASH This is most interesting, George. I can see why you aren't worried about having stuff to sell.

SELLERS That isn't all, by any means. There are some things in which the problem of scarce materials is not too important. There's the garbage disposer. Except for comparatively small amounts of copper and steel in the motor, the machine is practically all cast iron, and there's plenty of that. But what gets me really excited is the electric bed covering. The market for it has hardly been skimmed. And it is exactly the kind of load we need to help pay for new capacity that is costing us $200 or more per kilowatt.

CASH I wish those other fellows were here to hear this. They know what that capacity is costing.

SELLERS I wish they were here, too. Because I am going to assume now that soon there won't be available any ranges and water heaters and laundry equipment, any appliances at all. And even then I still say we should keep on selling.

CASH Selling what?

SELLERS Selling lighting.

JONES Mrs. Homec, will you feel his forehead and see if he has a fever? You know, George, you make me think of that song Bert Williams used to sing, "It's mebbe so, but I dunno, it don't sound right to me." No appliances, then no lighting fixtures either.

MRS. HOMEC No fever, Mr. Cash. George is entirely normal. I know, because he and I have talked this over thoroughly.

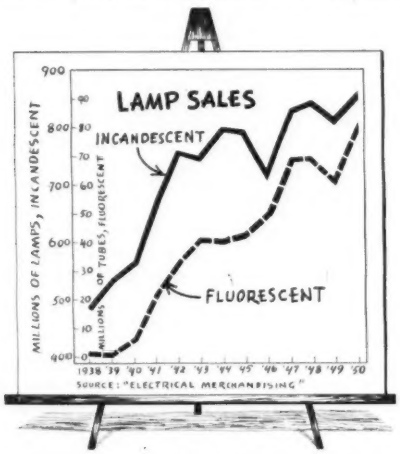
CASH All right, George, go ahead. But break it gently.

SELLERS OK, boss. In the first place, even if things get really tough, there will be lighting fixtures. Enough and plenty for the lighting that should be sold. The government will allow materials in short supply to be used for essential lighting in industrial plants and for protective and safety purposes. You can't depend on an industrial plant operator to call up and order modern lighting. Not by a long shot. You've got to get out and sell it to him.

Another thing. The fixture manufacturers are an ingenious and resourceful bunch. You can be sure that they will find and use every practicable way to put out a satisfactory product with the minimum employment of scarce materials.

CASH So there will be fixtures, eh? Well, I'll give you that. And that they'll justify a selling job in the industrial field at least.

SELLERS That's only part of the picture. Here's my other chart. Notice there aren't any gaps in the curves over the war years like in the charts I showed yesterday.



CASH I see. And I see that the deepest drop in incandescent lamp production came in 1946 when the war was over. Those curves are very interesting.

SELLERS Interesting isn't quite the right word. The curves are significant, I'd say, very much so. They indicate what we can expect in the time ahead—no major decrease in availability of light sources for ordinary uses. Even if the tungsten situation puts a crimp in incandescent lamp production, that will just put more emphasis on fluorescent lighting. That's why we can, and should, keep on selling lighting even if everything else goes up the spout.

And you can let your imagination roam in a very wide field when you think about lighting. Remember how the fluorescent tube burst on the world in the thirties? It was old stuff to the scientist. Have you heard about this electro-luminescence?

CASH Seems to me I read something about that before.

SELLERS Scientifically that's old stuff too. It's being worked on as you know. In practical lighting terms, nothing may come of it in our time. On the other hand, something may come, and fast.

And we're a long way from the end of development of the fluorescent lamp. We already have the low-brightness tube. I know one power company that already is pushing this tube, going all out on it, for general applications—schools, offices, stores, and work places in the home. There are probably others doing it, too. And a ballast made of copper and iron is not an absolute necessity for the operation of a fluorescent tube. An incandescent lamp can take the place of the ballast.

CASH These possibilities are exciting, of course. But, after all, they are just day-dreaming. What we are concerned with is what we have in our hands now. You can't go out and sell electro-luminescence today.

SELLERS Not today, but I am not so sure about tomorrow. Under the pressure that is developing in our economy, some of these things might come along pretty fast. But let them go. Let's think about some things that are in our hands now but that we haven't done much about so far.

CASH As for instance?

SELLERS Integration of lighting and architecture for one thing. People pay for lamps, fixtures, wiring and electricity, but what they buy is just one thing—light. And we have not yet made even a good start on wide employment of the idea of building light into the structures in which we live and move and have our beings. Why, just take the simple thing of valance and cove lighting in the home——

MRS. HOMEC Now you're giving me an opening Mr. Sellers. I was beginning to think I wasn't going to get a chance to say anything. You do have a teeny bit of a tendency to monopolize the conversation when you get enthusiastic on the subject of selling and the need for it.

CASH I've noticed that myself. George, you be quiet for a while and let the lady have the floor.

MRS. HOMEC I'll try to be brief, although it may be harder for me, being a woman and enthusiastic, too. Mr. Cash, I ask you to authorize Mr. Sellers to tell me I can hire ten or twenty or thirty more girls.

CASH What!!!

SELLERS That's what she said. And I go right along with it. But I'm to keep quiet. You have the ball, Mrs. Homec. Go on and make your end run.

MRS. HOMEC Home lighting girls are what I want. Enough of them so that we can call on each residential customer at least once a year. Not just a how-do-you-do-can-I-sell-you-some-lighting-today call, but a real sit-down-and-visit call in which the girl has time to explain modern lighting and show what it can do in the home.

CASH Do you have any idea what that will cost?

MRS. HOMEC Yes, I do. But, if you will allow me to say it, I don't think you have, not the right idea.

A FLOCK OF GIRLS visiting residential customers to sell home lighting—and the company . . . that's what Mrs Homec wants

CASH Well, go on, go on. These two days—I should be used to being brow-beaten by the sales department.

MRS. HOMEC Oh, Mr. Cash, I'm sure you don't mean that. Well, anyway, the cost will be around a dollar per dollar of EAR, maybe less. I know one company that is doing it for less.

CASH Mrs. Homec, I just don't believe it.

MRS. HOMEC You don't now. But I think you will when I have explained. I have ten girls in my department now, one home service adviser and an assistant in each of the five company divisions. The customer contacts of these girls are almost exclusively with groups—cooking schools, demonstrations, talks to clubs and so on. The work of these girls can not be definitely related to increased revenue. There is no way of determining the increased revenue they produce. But we all know their work is greatly worthwhile even though its result is intangible.

Now, Mr. Cash, when you asked me if I had my idea of the cost of the additional girls I want, you were thinking in terms of the present cost of my department, multiplying it in direct ratio. That cost is already on the books and is accepted as money well spent. The cost of the additional girls will be only an increment cost. It will be just their salaries plus supervision, plus direct expenses chargeable to their operations. None of the present home service cost should be added. These girls will bring in revenue, measurable revenue against which the cost of their operations can be assessed. On that basis, I am sure you will find the cost much lower than you thought just now. And think what the intangible benefit in goodwill will be from frequent person to person contacts with customers.

In 1947 when the Planned Lighting Program was launched, Ralph Wagner, then chairman of the Better Light—Better Sight Bureau, said that the average home has 26 sockets with a connected lighting load of 1,250 w and that it should be four times as much. Probably the figure is higher now, but we can be sure that it is not four times.

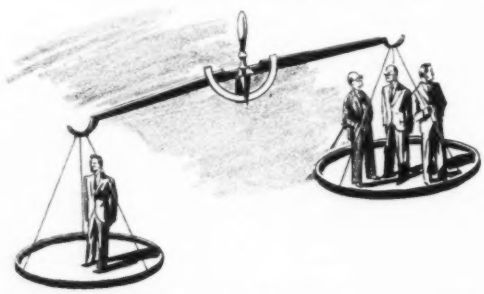
This idea of promotion of improved home lighting is really taking hold. The General Electric Lamp Division recently made a survey of the activity among 106 power companies. Definite plans for home lighting conditioning programs were reported by 52 companies; 88 were distributing the GE "Home Lighting Recipe" Books; 37 had plans for lighting demonstration homes; 11 were offering special inducements for sale of light conditioning equipment to their employees; 32 had plans for sales follow-up by retail outlets of promotional effort by the company.

Yes, Mr. Cash, home lighting is on the upsurge. And it can keep on when other selling activities of electric utilities have fallen by the wayside, if they do. It can prevent the great loss of customer contact that was suffered when utility sales departments disintegrated during the war years. Home lighting promotion will pay its way in increased revenue.

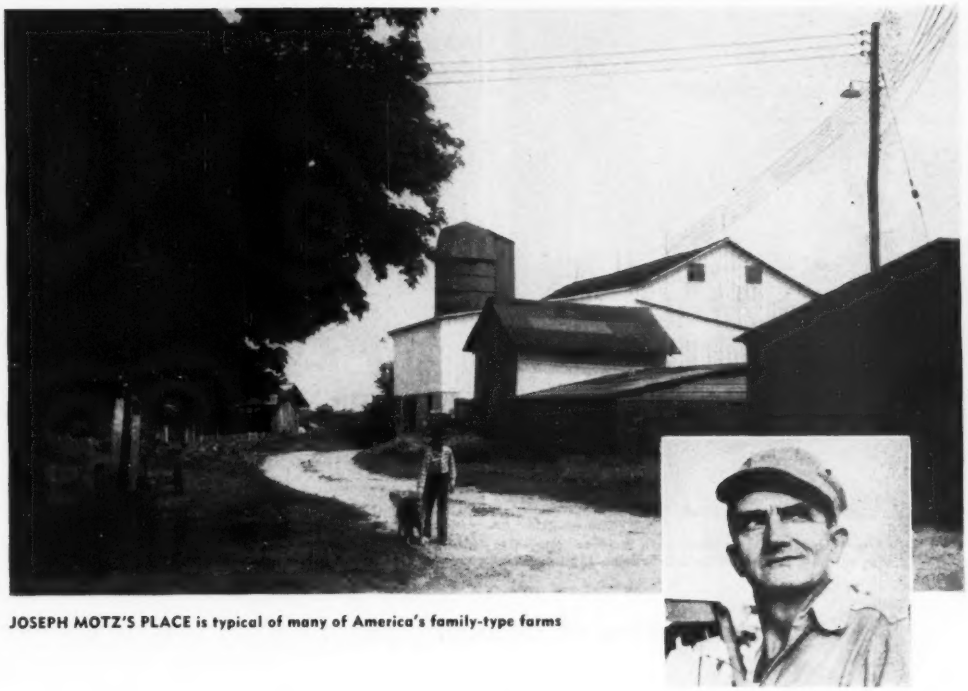
CASH I think I'd better turn you two out before you convince me that selling is the most important activity of the company.

SELLERS Well, isn't it? What good would our power plants . . .

Right at this point the tape goes blank—nothing more on it. The reader is left to ponder on that question, "Well, isn't it?" which *is* a question worthy of pondering.



IN BALANCE—sales activities and service considerations



JOSEPH MOTZ'S PLACE is typical of many of America's family-type farms

Profits From Farm Electrification Buy More Electrification

"Snowballing" effect proved by record since 1944 of increasing number of electricity applications on family-type farm

W. D. HEMKER, Agricultural Engineer
Westinghouse Electric Corp, East Pittsburgh, Pa.

Within six years electricity on an average farm can increase by more than 51% the money earned per hour of productive labor—that's the lesson learned from a practical electrification experiment on the Joseph Motz farm near Warren, Ohio.

The evidence that farm electrification, coupled with good management and sound practices, more than pays its own way is contained in a report just prepared by Doane Agricultural Service, Inc, for the Westinghouse Electric Corp's farm electrification department.

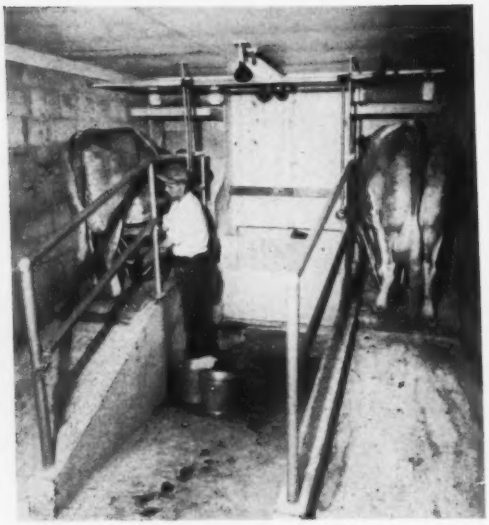
Since 1944, when electric power first reached the 262-acre Motz farm, accurate records and analyses of the farm's production and progress have been kept by Doane. The test program was initiated by Westinghouse in cooperation with the Ohio Public Service Co (recently merged into Ohio Edison Co), on whose lines the farm is located.

That Joseph Motz and his son take full advantage of electricity can readily be seen from the amount of energy they use on their farm. During 1945, the first full year that electricity was available, 1,496 kwhr were used. During 1949, usage was 5,612 kwhr and in 1950, 11,810 kwhr, an increase of 100% over 1949.

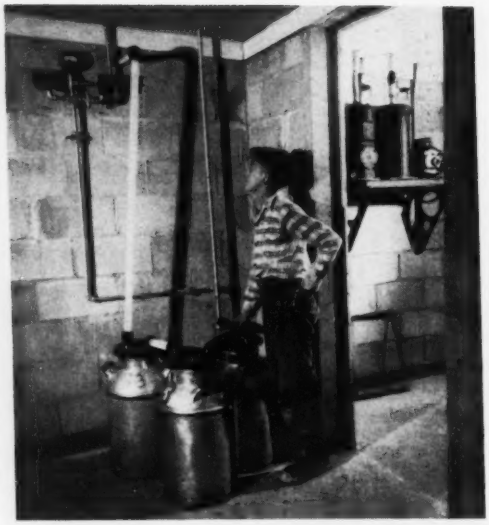
No "dude ranch" affair, the continuing experiment, now seven years old, is being carried out under conditions identical to those faced by the average farmer. Mr. Motz has purchased new electrical equipment at retail prices, using only the profits from the farm's operations to do it.

In 1944, the Motz farm returned to the farmer 66¢ for each hour of work he put into the various productive

An account of the start of this project was printed in "Electrical World," Dec. 23, 1944, page 118.



A FAR CRY from the former stanchion barn is Motz' modern and time-saving milking parlor. That's Bob doing the milking



MILK FLOWING into the cans is watched by Joe Motz' younger son. In the next room is the milker vacuum pump

Electrification of farm equipment pays a dividend—

enterprises. By 1950, this return had increased to $1.17 for each hour of work. Even eliminating the effect of the increase in farm prices from 1944 to 1949, the return per hour was up more than 51%. By reducing the time required for basic farm operations, Mr. Motz and his son Bob had more time for other enterprises or for leisure, as they chose.

Although farm prices have increased during the test period, the cash return on the Motz farm has kept well ahead of the general rise in prices that are received for all agricultural products.

On the parity index base of 100 for farm prices between 1910 and 1914, prices in 1944—the year the Westinghouse experiment began—had a value of 196, while last year they had risen to 256, an increase of 31%. On the same basis, the farm cost index rose from 174 to 246, or 41%.

Raise in Pay . . . Adjusting the cash return of the farm to these figures, Mr. Motz and his son received a real increase of 34¢ for each hour of productive labor through their electrical "hired hands". In other words, if farm prices had remained stationary during the six-year period, their hourly earnings still would have risen from 66¢ to $1, 51%.

This experiment was initiated to get grass-roots proof that electricity on the farm can save work and increase production and earnings. A not-above-average farm that did not yet have electricity was needed. The power company supplied the names of a number of possible farms in its territory that might meet the requirements, and a Westinghouse farm electrification man and a Doane representative visited each farm on the list. The Motz farm, they decided, offered the most likely spot for such a long-range experiment, and the Motz family was glad to lend its cooperation for the project.

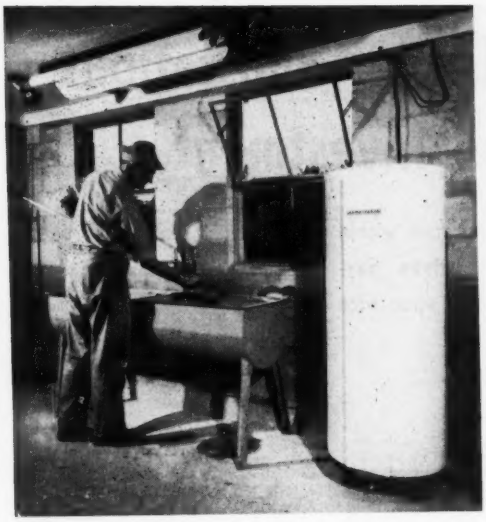
Primarily a dairy farm, the place is operated by Joseph Motz and 27-year-old son Bob. In 1944, the 140-acre farm required a total of 6,860 hr of labor by the two men. In 1950, it required only 4,532 hr even with the addition of 122 acres purchased by Bob. More than 50% of the total farm labor saved was in the dairy operation where electrical equipment reduced dairy labor demands by 37%, even though the number of cows was increased during the test period.

Rapid Improvement . . . One of the first things installed was an electric water-pumping system. Formerly the cows had been watered by hand during the five winter months the animals were in the barn. After the installation of a water system, with a continuous supply of water in individual cups before the cows, the daily milk production of the 11 cows increased by more than 2½% while 175 man-hours of water-carrying were eliminated entirely.

An electric-powered emery wheel in one haying seasons saved 18 hr on the sharpening of mower sickles and sliced a 132 hr total off the annual work schedule. An electrically-driven seed cleaner and a cement mixer that also served to mix feed were purchased to reduce the time spent on these jobs. An electric fence simplified the task of keeping the dairy herd in the proper pasture-land.

Meanwhile, electric lights were replacing the oil lamps, not only making life safer and more pleasant but eliminating the tedious chore of cleaning the lamps and lanterns.

In 1946, the father-and-son team



ELECTRICALLY-HEATED WATER from this 30-gal tank keeps milk cans and other dairy equipment sanitary

HOME-MAKER'S work on farm is lightened by refrigerator, range, water heater, other appliances

the benefits of electrical living in the farm home

purchased a combine. This not only reduced the time necessary to harvest the wheat crop, but permitted time for similar work for their neighbors. In 1949, they invested in a hay baler that is used to bale hay on the same basis. A third major purchase was a grain and baled-hay elevator driven by a one-third horsepower motor.

More Profit Ahead . . . The six-year figures do not fully include benefit from the biggest improvement of all that was put into operation early in 1950. This was a milking parlor and related equipment that already has cut the milking time from a 50-min task for three people to a 40-min chore for one.

The milking parlor, milk room and feed room were added to the barn, and the former cow stall space converted into a loafing barn. At a cash outlay of $949, exclusive of equipment, and the expenditure of 1,061 hr of labor, the Motz's now have facilities which will permit them to double the present size of the milking herd. They have enough young heifers and calves coming along to reach this goal in a year or two.

The parlor is equipped with a pipe line "cow to can" electric milking machine. The milk passes directly into 10-gal cans in the milk room. Here are installed a cooler, with a capacity of four 10-gal cans, and a 30-gal electric water heater to supply hot water for washing cans and other equipment.

In both the milking parlor and milk room, fluorescent lighting gives ample glare-free light, and heat-lamps provide a comfort zone at the washing vats and in the milking area during the winter months. Still to be completed is the feed room where electricity will replace much of the time and effort now required to grind and store grain and other feed for the dairy cattle.

And in the Home . . . The Motz test farm also has proved another point—electrical farming can help supply the means for electrical living in the farm home. While the Westinghouse studies have been concerned almost entirely with the farming operation, the Motz home has undergone many improvements and changes for the better.

When the new pumping system was installed, running water became available in the home as well as in the barn. This improvement eliminated carrying of drinking water 49 miles a year, and provided indoor plumbing and bath facilities. In addition, it permitted the installation of a water-softening system which is virtually a necessity in this section of Ohio because of the extreme hardness of the well-water.

An electric washing machine trimmed a total of 144 hr annually from the weekly washing job, while an electric iron eliminated 48 more hours of work. Electric lights cut out 36 hr formerly spent cleaning and filling kerosene lamps, and a vacuum cleaner made housekeeping a much easier chore.

Mrs. Motz and her daughter Lois now have at their disposal a long list of other labor-and-time saving electrical appliances. An electric range prepares their meals, and an electric refrigerator preserves their food. The electric water heater in the basement guarantees an ample supply of hot water. A toaster, a mixer, and a home pasteurizing unit are invaluable kitchen aids, while radios and electric fans provide additional recreation and comfort.

Aerial Cable and Larger Substations Reduce System Investment

Smaller voltage drop of aerial cable permits long runs within allowable voltage regulation between larger substations. Savings may be 20% if aerial cable costs are 150% of open wire

V. A. RYDBECK, Central Station Divisions
General Electric Co, Schenectady, N. Y.

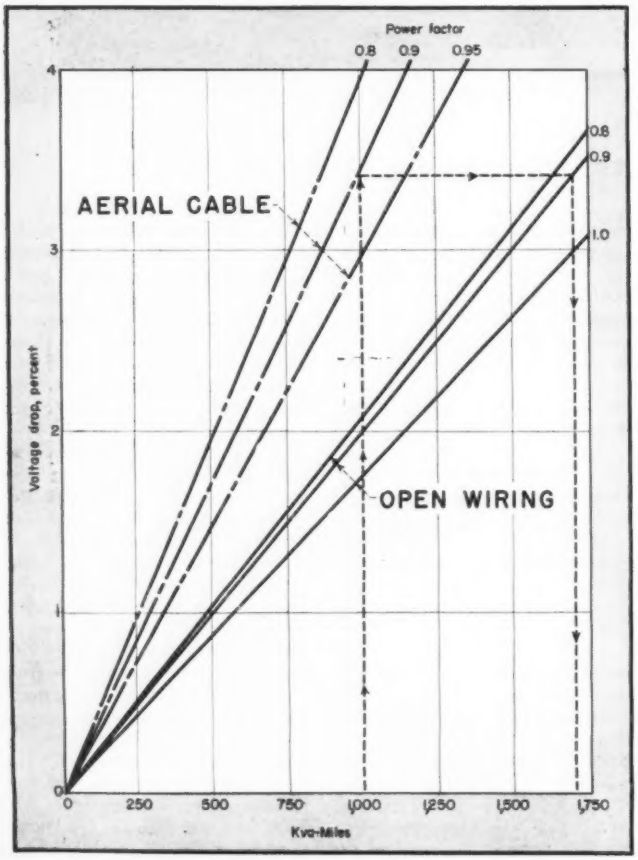


FIG 1—COMPARATIVE REGULATION of No. 4/0 open wiring vs aerial cable feeders. Dotted lines show aerial cable will carry 1,700 kva-miles against 1,000 kva-miles for open wire at 90% power factor, with the same 3.45% voltage drop

Potentialities of combining aerial cable with larger-size substations should not be overlooked in considering the economics of a distribution system to serve a given area. Aerial cable may actually cost less per kva-mile than open-wire circuits while meeting the voltage limitations usually encountered with the open-wire construction.

Net saving may amount to 20% provided aerial cable costs are only 150% of open-wire costs. Aerial cable may prove most economical to the point where it costs 200-250% of open-wire. In addition to the immediate dollar savings, aerial cable offers other benefits: Short poles, reduced clearance, few or no crossarms, reduced tree trimming, fewer storm outages, improved appearance, increased reliability, and reduced radio and telephone interference.

Substations Fewer but Larger . . . Voltage drop rather than thermal loading is usually the limiting factor in overhead open-wire primary circuit design. Reactance often accounts for the major portion of this voltage drop. Aerial cable, being made up of conductors in close proximity, has a greatly-reduced reactance. Thus, when aerial cable is used for three-phase feeder mains, larger substations can be installed at greater intervals without exceeding the voltage drop of open-wire construction. Fig 1 shows that at 90% power factor a No. 4/0 aerial cable at 4.16 kv will carry 70% more kva-miles than a standard-spaced open-wire circuit having the same voltage regulation.

Substation dollars per kva are shown by Fig 2 and 3 to be, in large measure, the determining item in distribution system investment. Whether the distribution system is primary network, radial, or duplex type, the same advantage of larger substations is shown by these illustrations to exist for load densities ranging from 300 to 2,400 kva per square mile. Larger

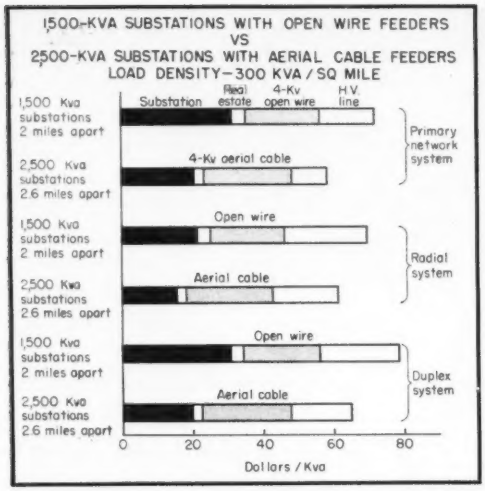


FIG 2—COMPARATIVE SYSTEMS COSTS for 1,500-kva substations, open-wire feeders, vs 2,500-kva substations with aerial cable feeders for load density of 300 kva per sq mi

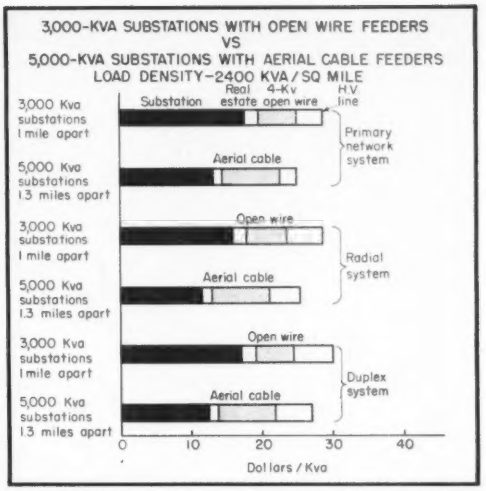


FIG 3—COSTS COMPARED for 3,000-kva substations, open-wire feeders, vs 5,000-kva substations with aerial cable feeders. Load density was here assumed 2,400 kva per sq mi

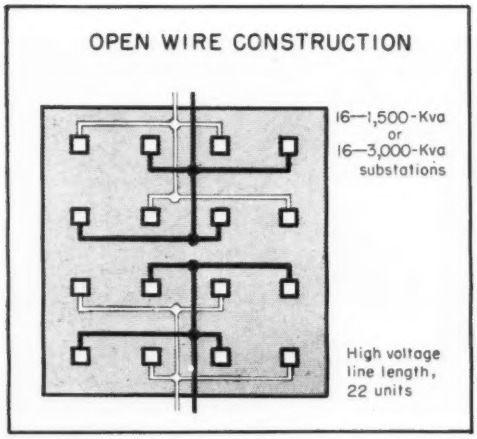
substations have lower cost per kva; in some cases, 35% lower. Savings in real estate, high-voltage line supplying substations, and substation maintenance all tend to favor the use of aerial cable.

Applied to a practical case, 1,500-kva substations spaced two miles apart with open-wire construction can be replaced by 2,500-kva substations spaced 2.6 miles apart. Or, instead of 3,000-kva substations spaced one mile apart, aerial cable will permit use of 5,000-kva substations at intervals of 1.3 miles.

The cost comparisons made in Fig 3 are based on aerial cable construction costs of $12,000 per mile, and open-wire costs at $8,000 a mile. The cable is 4.16-kv, No. 4/0. Land for the substations is assumed at $6,000; 13.8-kv open-wire costs are $8,500 per mile.

Additional Savings . . . Whereas sixteen 1,500-kva substations are required to serve a given area with open-wire construction, only nine 2,500-kva substations are needed for this same area when using aerial cable. Besides the obvious saving in real estate, there is a saving of 40% in the length of high-voltage line to supply these substations.

Where high-voltage lines to substations are underground rather than overhead, the price differentials between underground cable and overhead wire tend to further enhance aerial cable savings.



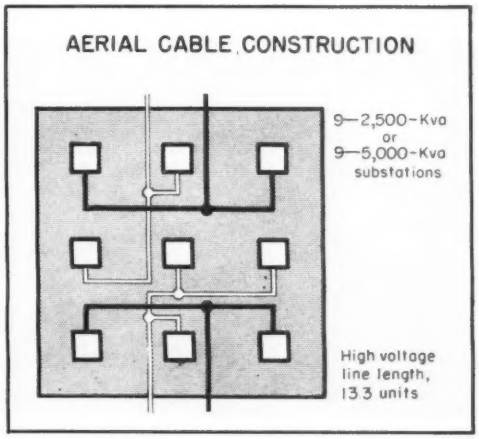
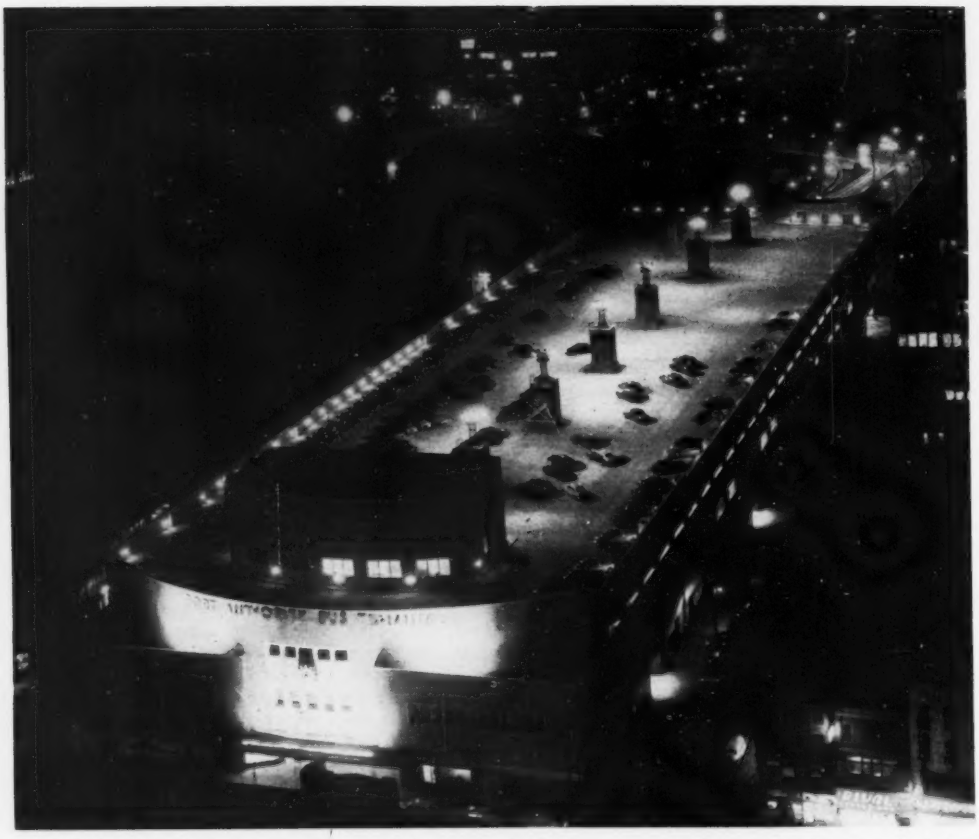
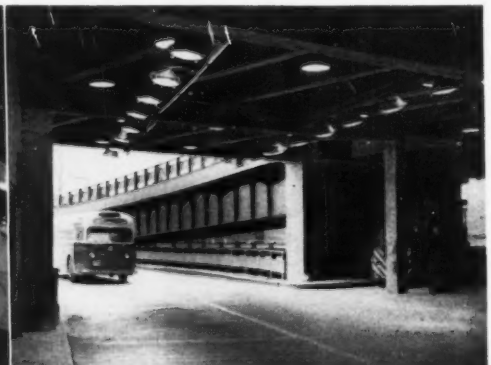


FIG 4—LINE CONSTRUCTION to substations is reduced by 40% in this example by use of aerial cable. In this comparison, and that of Fig 3, 4.16-kv, No. 4/0 aerial cable was assumed at a cost of $12,000 per mile—or 150% of of open-wire costs. Cost of 13.8-kv open-wire lines to substations at $8,500 per mile; substation real estate, $6,000



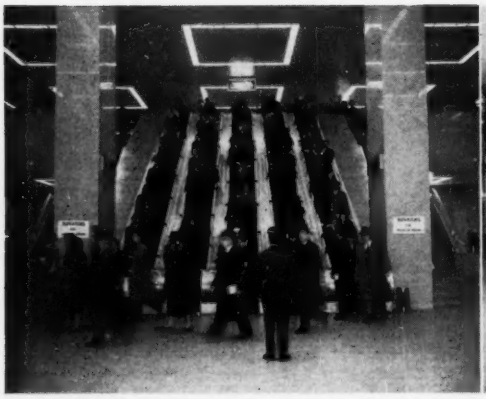
1 FLOODLIGHTS on front entrance marquee and lower roof level provide high level lighting of clock and building facade. Ramps from Lincoln Tunnel (at upper right) are lighted to an average of 1 ft-c with sodium vapor luminaires. Each of six towers on vent houses has eight 500-w floodlights with spread lenses, resulting in about 2 ft-c avg intensity

2 PARAPET LIGHTS (128) in parking roof parapet walls are specially modified with plastic lenses and heat barriers to eliminate usual wire guard and high temperature fixture wire. Spaced about 17 ft, lights each have 100-w lamp



Crouse-Hinds Co Photo

3 INTENSIVE LIGHTING at bus entrances provides high lighting of vertical surfaces to aid visual adjustment of entering relatively dim interior. Floodlights combined with general lighting and natural daylight provide 125 ft-c



4 MOTOR STAIRS speed commuters between main concourse and suburban bus level. Colored fluorescent lights under treads at head and foot of each of the 31 stairs delineate joints between treads and help prevent accidents

5 RECESSED TROFFER (1, 2, and 3-lamp) fluorescent lighting in concourse areas and waiting rooms provide average of 18 ft-c. Emergency lights form part of general lighting pattern. Note highlighted wall dioramas and directional signs

New York's Bus Terminal Pioneers New Electrical Ideas

Here are the outstanding features of the electrical installation in the new $24,000,000 Port Authority Bus Terminal in New York City

CARL R. JOHNSON, Electrical-Mechanical Engineer
WILFRED HENSCHEL, Asst Electrical Engineer
The Port of New York Authority

Unique in its over-all conception as the first large scale solution to the problem of providing a safe, efficient and attractive terminus for the many bus lines entering New York City, the recently completed Port Authority Bus Terminal is unique, as well, in many of its electrical design features.

The conventional elements of the electrical system are not discussed herein except to say that distribution is at 120/208 v, 3-phase, 4-wire by means of radial feeders, as shown on the accompanying diagram.

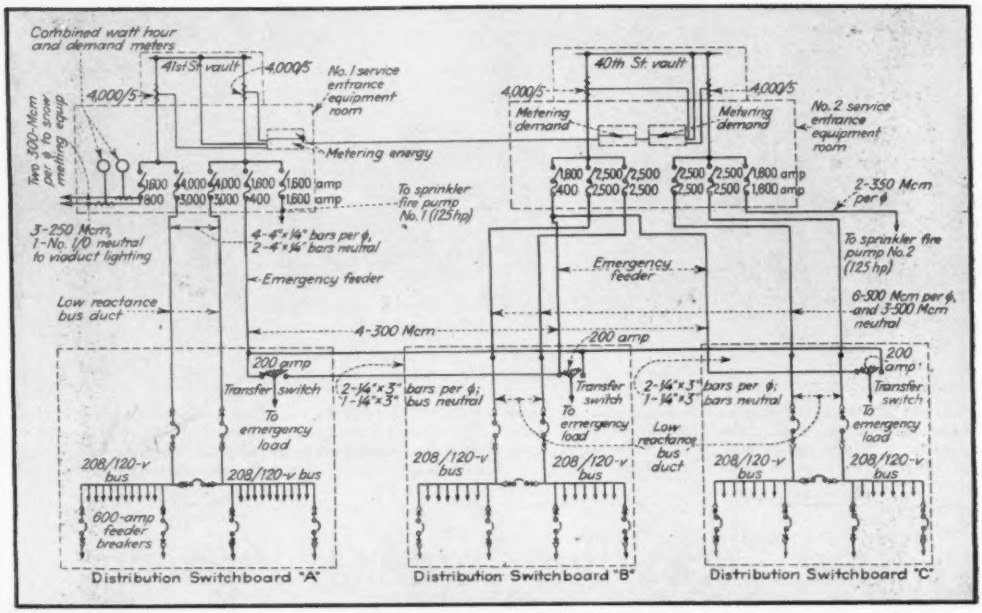
Entrance Lighting . . . Transitional lighting provided at the bus entrances to the long distance and suburban bus levels aids visual adjustment upon entering the relatively dim interior from a sun-lit exterior. This has been done by combining general overhead lighting of approximately 50 ft-c at the entrance, that diminishes to about 4 ft-c 125 ft from the entrance with flood-lighting of obstructions such as columns and curbs and natural daylight.

The high-lighting of vertical surfaces instead of high illumination levels on a dark, oil-stained pavement has been found to be a practical solution of the problem. During hours of darkness, the lighting intensities at entrances are reduced to that of adjacent areas.

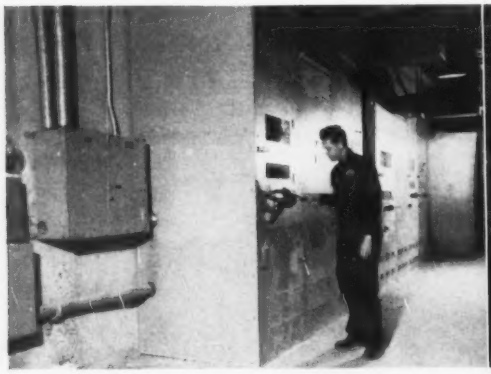
Lighting Control . . . Lighting in the concourses and the bus lanes may be controlled from the watch engineer's control panel to provide evenly distributed lower intensity lighting during "off" hours. The circuits in the main and suburban concourses and the bus lanes are so arranged that lights may be turned off in a definite pattern by operating the remote control switches. Circuits on the long distance concourse are so arranged as to permit one, two or three lamps in the three-lamp fluorescent fixtures to be lighted, as desired.

Ramp Lighting . . . Lighting on the ramps from the Lincoln Tunnel Plaza to the suburban bus level and the parking roof is by means of astronomical time-switch-controlled sodium vapor luminaires. This choice of lamp was made on the basis of high efficiency plus the value of the distinctive yellow light in associating the ramps with other similarly lighted approaches to the Lincoln Tunnel and in guiding motorists to the parking roof.

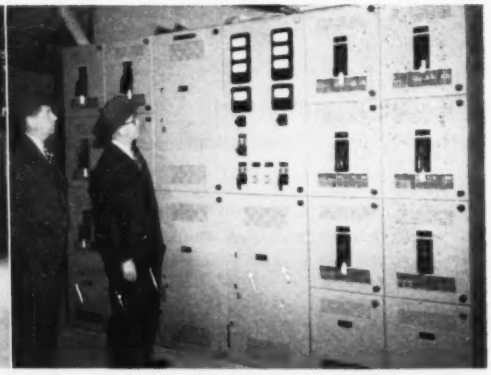
The directional signs on the ramps are equipped with cold cathode lighting behind diffusing plastic panels. Some signs are so circuited as to remain on 24 hr a day; others are connected to the astronomically-controlled ramp light-


Combined watt hour and demand meters
41st St. vault
4,000/5
No. 1 service entrance equipment room
Two 300-Mcm per ϕ to snow melting equip
Metering energy
1,600 4,000 4,000 1,600 1,600 amp
800 3,000 3,000 400 1,600 amp
To sprinkler fire pump No. 1 (125 hp)
3-250 Mcm, 1-No. 1/0 neutral to viaduct lighting
4-4"x¼" bars per ϕ, 2-4"x¼" bars neutral
Emergency feeder
Low reactance bus duct
4-300 Mcm
200 amp
Transfer switch
To emergency load
2-¼"x3" bars per ϕ; 1-¼"x3" bus neutral
208/120-v bus
600-amp feeder breakers
Distribution Switchboard "A"
40th St. vault
4,000/5
Metering demand
No. 2 service entrance equipment room
1,800 2,500 2,500 2,500 2,500 1,800 amp
400 2,500 2,500 2,500 2,500 1,800 amp
2-350 Mcm per ϕ
To sprinkler fire pump No. 2 (125 hp)
Emergency feeder
6-500 Mcm per ϕ, and 3-500 Mcm neutral
200 amp
2-¼"x3" bars per ϕ; 1-¼"x3" bars neutral
Low reactance bus duct
Distribution Switchboard "B"
Distribution Switchboard "C"

6 **FEEDERS are radial—4-wire, 3-phase, 120/208-v. Independent service entrances from two Con Edison network vaults provide high service reliability. Automatic transfer switches insure continuous service on emergency feeders**



7 **SERVICE ENTRANCE equipment room switchboard has fused dead-front knife switches. Note enclosed bus duct at upper right feeding distribution switchboard. At left is metering equipment for viaduct lighting and snow melting**

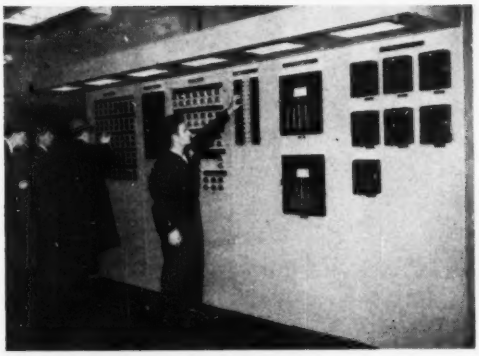


8 **DISTRIBUTION SWITCHBOARD has circuit breaker branches. Main breakers have "one-shot" reclosers with adjustable time delay for prompt service restoration in event of main breaker tripping brought about by a feeder fault**

ing circuits and go "on" and "off" with the ramp lights while a third group is remotely controlled from the parking roof to indicate whether or not the parking roof is full. These latter signs posed the difficult problem of making the lettering visible only when the signs are illuminated from within. The problem was solved by the use of laminations of plastic of several colors which tend to obscure the lettering on one of them when viewed by reflected light.

Parapet Lighting . . . In the parapet walls around the periphery of the parking roof and in the penthouse walls are installed specially modified standard recessed lights designed to provide adequate lighting on the sidewalks without producing glare in the eyes of motorists. For the standard fresnel lens was substituted a plain, diffusing plastic lens which produces a warm glow of evenly diffused light. The high impact resistance of the material permitted the usual wire guard to be omitted.

The standard fixture was further modified by the installation of a heat barrier between the upper and lower parts



9 WATCH ENGINEER'S control panel permits remote control of lights to meet varying requirements; remote indication and control of electrical and mechanical equipment trouble; and for control of the zone heating system

containing, respectively, the lamp and the wiring connections. So doing reduced the temperature in the wiring chamber by approximately 11 deg C, thereby permitting the circuit wiring to be connected directly to the terminals without subjecting it to excessive temperatures and avoiding the necessity of using separate junction boxes and high temperature fixture wire.

Emergency Lighting . . . All public areas, and certain non-public areas, are provided with emergency lighting by means of a separate distribution system supplied from two sources of power through automatic transfer switches. The power sources are the two independent service entrances from each of which a feeder is carried to the three substation rooms in which the transfer switches are located. Each transfer switch is connected to both emergency feeders. Upon failure of its normal supply, the load is automatically transferred to the alternate feeder. From the transfer switches, emergency power is distributed throughout the building to separate panels.

This method of emergency lighting was selected in view of the high degree of reliability of the public utility network supplying power to the building.

Reclosing Breakers . . . The main breakers on the switchboards are equipped with "one-shot" reclosers with adjustable time delay, for automatic service restoration in the event of main breaker tripping caused by a feeder fault in excess of the interrupting rating of the cascaded feeder breaker. Should the main breaker open on a switchboard bus fault, it would lock itself out after one reclosure and trip-out; on the other hand, if the fault is in a feeder, (and in excess of the instantaneous trip setting of the main breaker), the feeder breaker will remain open but the main breaker will reclose, thereby restoring service to the other feeder breakers on the same bus section. All faults of lower magnitude will be cleared by the individual feeder breakers without operation of the associated main breaker.

Interlocking Switchgear . . . In order to provide a maximum of safety in the operation of the main switching equipment, electrical and mechanical interlocking has been incorporated in the design.

The two main breakers and the associated tie breaker at each switchboard are electrically and key-interlocked with one another so that not more than two of the three breakers can be closed at the same time.

The main breakers at each switchboard are key-interlocked with their corresponding service entrance switches to prevent operation of the service switches under normal load conditions. Emergency keys in "break-glass" boxes have been provided at the service entrance switches to permit operation under load in extreme emergencies.

Each service entrance switch feeding an emergency lighting circuit is equipped with an electrical interlock designed to operate the automatic transfer switch to the other emergency circuit when the service entrance switch is opened.

Tenant Metering . . . Tenant areas comprise a large and important part of the bus terminal space. It became evident early in the design of the electrical system that since the initial and future subdivisions of the tenant areas could not be pre-determined, the method of distributing and metering electric power for tenant use would have to provide considerable flexibility.

This was accomplished by the use of tenant metering and distribution panels of unique design. These panels consist essentially of two parts—a metering section equipped with fused switches and watthour meters, and a distribution section equipped with thermal circuit breakers fed from a split bus with removable links.

Engineer's Control Panel . . . The control and indication of all important elements of the electrical and mechanical systems in the building are centralized in the watch engineer's control panel which comprises the following sections: Lighting control panel, pilot light panel, motor control panel, annunciator and trouble panel, heating, plumbing and air-conditioning panel, and heating zone panel.

Bus Dispatching . . . The bus dispatching system on the long distance bus level is designed to control the flow of buses to the forty sawtooth berths and the auxiliary platform entirely from the main dispatcher's control desk.

The system performs the functions of bus detection, assignment, delay and release, by means of treadles, relays, pilot lights, berth number signs and a berth assignment sign.

Clock System . . . The clock system is of the electronically self-regulating type without special clock wiring. The entire electrical distribution system serves as the channel for transmission of the high frequency impulses upon which the system depends for periodic correction, if necessary, and an electronic clock conected to *any* 120-v outlet on the system will regulate automatically every hour.

Public Address System . . . The public address system, utilized principally for announcing and paging, has been designed as well for high fidelity music reproduction and for transmitting warning of excessive steam pressures within the building. A total of 195 loud speakers, of five types tailored to the different acoustical environments in which they are installed, provide almost complete coverage throughout the terminal.

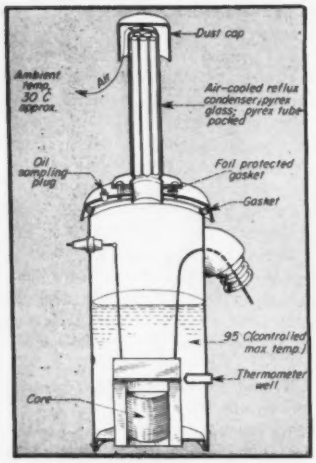


FIG 1—REFLUX CONDENSER restricts evaporation during cyclic controlled-temperature acceleration of oxidation. The condenser is air-cooled

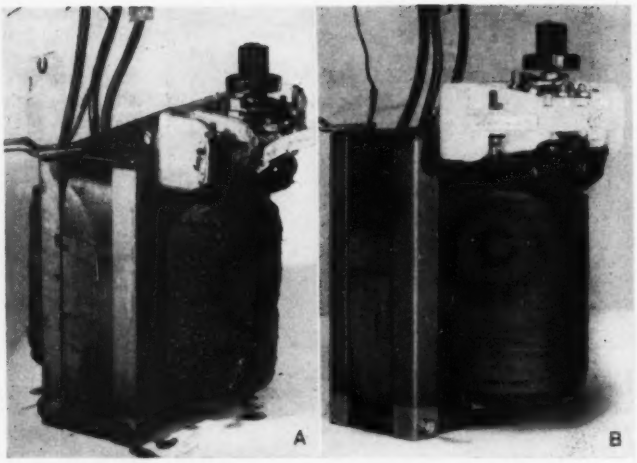


FIG 2—INHIBITOR definitely delays oxidation and sludge. (A) Total sludge of 121 grams deposited on core and in tank during six months' operation of high grade commercial oil without inhibitor; (B) sludge-free core after 11 months' operation with inhibited oil B; sludge deposited in tank is seven grams

Life of Inhibited Oil Revealed By Accelerated Tests

Intermittent heat runs stimulate oxidation to evaluate differences among inhibited transformer oils and between inhibited oils and uninhibited oils of shorter life

WILLIAM G. HORSCH, Research & Development Department
Socony-Vacuum Oil Co, Inc, Paulsboro, N. J.

A test in commercial transformers of small size has been developed whereby the relative behavior of inhibited oils may be established in runs of about three years' or less duration. Conventional, uninhibited oils in the same test are deteriorated to the discard point in about two to eight months. The close similarity to commercial operating conditions, although greatly accelerated, warrants the assumption that the results are indicative of relative service life.

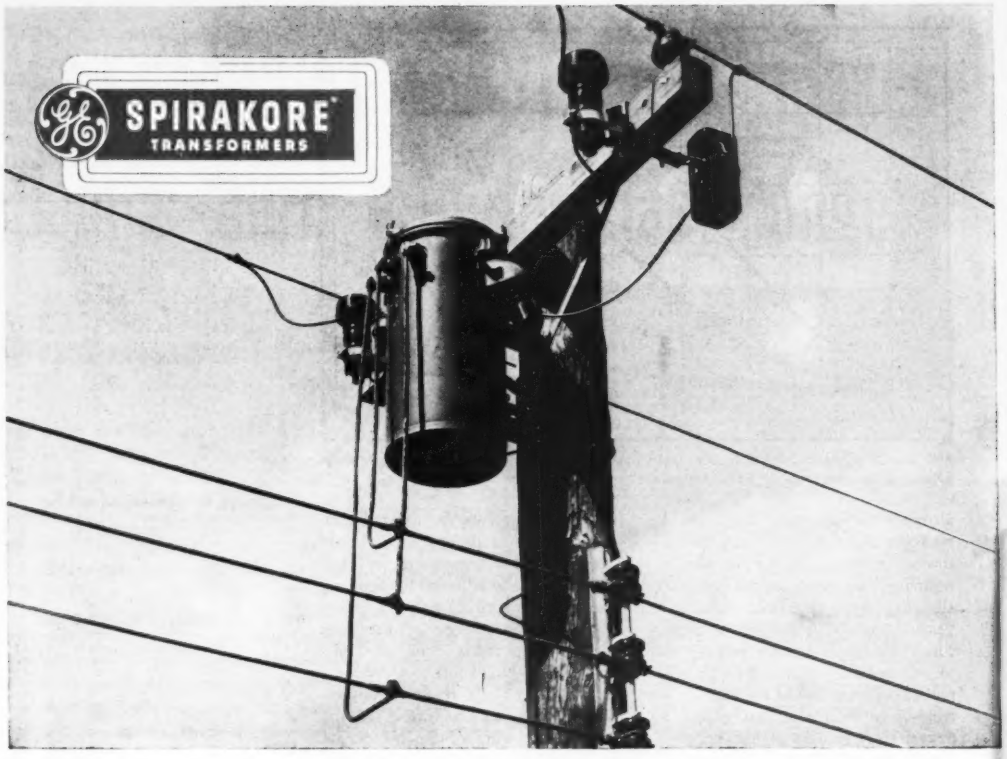
Uninhibited Oil Tests . . . In previously reported tests, conventional oils aged in transformers at a constant top-oil temperature of 85 C with the transformer lid raised slightly to permit air to enter freely were found to require periods ranging up to eight years for their evaluation*. Apart from the cost and inconvenience, such long test periods are a serious handicap on development work.

Obviously the life of inhibited oils must exceed that of conventional oils if they are to attract commercial interest. Thus a much more rapid transformer test was urgently needed. The greatest obstacle to developing such a test lay in retaining the essential characteristics of practical commercial operation in so far as they influence the aging of the oil, at the same time providing a high degree of acceleration. For example, too high a temperature might affect certain solid components of the transformer adversely, although raising the temperature in itself is one of the simplest means of accelerating the oxidation.

Oxidation Process . . . In normal operation, particularly in recent years, transformers are rather tightly closed. Oxidation takes place very slowly and appears to be governed to a great extent by the rate of influx of the oxygen of the air. Thus oxygen may enter as the result of breathing or slow leakage. In conservator type equipment, oxygen may diffuse in the dissolved condition from the conservator to the oil in the main tank as well as be carried in physically when the oil contracts during periods of light load.

It was found in the earlier work mentioned that if the dissolved and

* Wm. G. Horsch, "Electrical World," Aug. 3, 17, and 31, 1946.



Finish on General Electric Transformers saves one, maybe two, repaintings

San Diego Gas and Electric has been running extensive tests on paint finishes. The Melaglyp paint on General Electric transformers, they say, is superior to any other paint tested. It will save one, maybe two, repaintings.

This is testimony from a company that has in one location almost every condition that is unfavorable to paint: Salt spray. Dry spells during which salt never washes off. Heavy dew. Intense California sunshine.

Melaglyp, a greatly improved paint made with melamine-modified Glyptal* alkyd-resin, has been standard on all G-E Spirakore transformers shipped since 1947. We are confident that you'll find this paint is cutting your maintenance cost.

**Registered trademark of General Electric Company.*

Apparatus Department, General Electric Company, Schenectady 5, N. Y.

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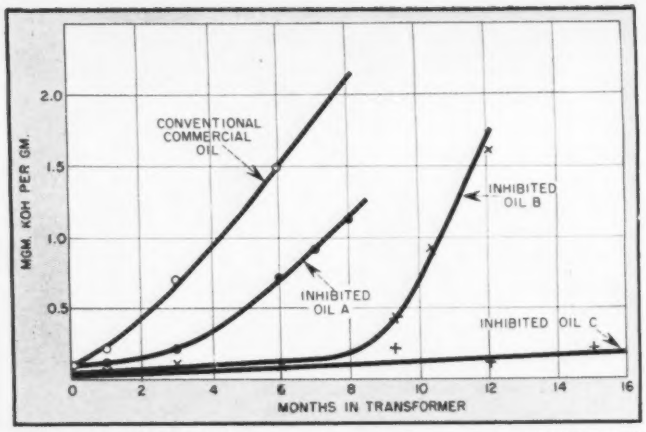

FIG 3—COMPARISONS of acidity development in conventional and inhibited oils after cycling operation at 95 C maximum temperature

air-space oxygen was swept out by nitrogen, the oil in a sealed transformer, operated continuously at 85 C, remained virtually unchanged, and sludging was negligible, after five years. Since it is the oxidation susceptibility inherent in various oils and inhibited blends that are to be compared, the tests should be made under conditions such that an excess of oxygen is freely available.

Cyclic Aging Adopted . . . The technique adopted after some preliminary trials of various conditions consists of a cyclic aging operation at well above commercial temperatures, with controlled breathing. The cycle is as follows. A Microswitch actuated by a cam causes the voltage to be on for 7 hours, off for 1 hour, this sequence being repeated three times per 24 hours throughout the run. The transformers are loaded by a feeding-back connection between two pairs of busses, one at rated voltage, the other arranged to swing from rated to about 20% above rated by means of a temperature controller-recorder.

A number of pairs of units are operated simultaneously, each unit keeping in step with one containing the temperature-sensitive bulb of the controller. During the "on" period, and after the temperature has risen sufficiently, the oil at a level even with the core top is maintained automatically at an average of 95 C.

Reflux Condensers . . . This lasts for about five hours out of each cycle. In the subsequent "off" period the temperature falls to about 75 C. Minor differences in temperature between transformers are adjusted by applying a suitable amount of asbestos paper lagging to the outside of the tank (Fig 1). The reflux condenser, air-cooled, restricts evaporation. Ambient temperature is kept roughly constant at 30 C so that the extent of the temperature swing of the oil during the current-off period always will be the same.

Changes Rated . . . During the run observations are made of neutralization number, electrical resistivity, specific gravity, and viscosity of samples of the oil taken out at regular intervals. The run also is interrupted briefly two or three times to determine the total weight of deposited sludge. Evaporation being negligible and the quantity of oil removed as samples being small obviates the need for the addition of make-up oil.

Sludge Formation Referred . . . The photograph (Fig 2A), shows the extent of deterioration of a conventional oil after 6 months' operation. The neutralization number at that time was 1.5 and the deposited sludge amounted to 121 grams as compared with the arbitrary limit of 75 grams (in a 1.5 kva transformer), equivalent to about 0.5% by weight of initial oil change.

Complete absence of sludge on the core is shown in Fig 2B after 11 months' operation with an inhibited oil, the neutralization number at that time being 1.0. Deposited sludge in the whole transformer was 7 grams.

TABLE 1—Progressive resistivity, gravity, viscosity, and sludging under accelerated oxidition

Months on Test	Conventional Commercial Oil	Inhibited Oil A	Inhibited Oil B	Inhibited Oil C
Neutralization Number, Mg KOH / g				
Start	0.10	0.10	0.03	0.04
1	.20	.10	.07	.08
3	.7	.20	.10	.10
6	1.5	.7	.10	.10
7	.....	1.1	.....	.....
8	.....	.....	.....	.....
9½	2.4	.....	.4	.20
10½	.....	.....	.9	.....
12	3.6	.....	1.6	.12
15	.....	.....	2.7	.20
Electrical Resistivity at 85 C, ohms-cm x 10^{12}				
Start	0.12(?)	24.7	31.0	74.2
1	2.2	19.6	40.0	30.1
3	.86	6.1	5.9	28.0
6	.20	.40	7.15	17.1
7	.....	.62	.....	20.7
9	.....	.....	.....	.....
9½	.076	.....	2.35	.....
10½	.....	.....	.80	.....
12	.0008	.....	.25	7.9
15	.....	.....	.13	3.6
Specific Gravity 60/60 F				
Start	0.884	0.884	0.881	0.868
1	.889	.886	.882	.869
3	.892	.882	.882	.869
6	.893	.888	.877	.869
9	.....	.....	.....	.869
9½	.893	.....	.881	.....
12	.894	.....	.887	.868
15	.....	.....	.892	.869
Viscosity at 100 F, Saybolt U. Seconds				
Start	55	56	55	53
1	56	56.6	55	53.5
3	57	57	56	54
6	58	58.5	56.7	54.5
7	.....	58.6	.....	.....
9	.....	.....	.....	55
9½	62	.....	57	.....
10½	.....	.....	58	.....
12	67	.....	60	56
15	.....	.....	62.5	57
Sludge (total deposited in transformer), grams				
6	121	.....	.....	.....
7	.....	12	.....	.....
11	.....	.....	7	.....

Inhibited Oils Differ . . . The purpose of this paper has been to present a method of testing and to show that a differentiation between various inhibited and conventional oils may be achieved in a reasonable length of time considering the importance of the results obtained. The runs are continuing. Table 1 and Fig 3 shows a few typical data. Ultimately correlation with some form of accelerated laboratory oxidation test will be tried.

Results thus far indicate that when the work is complete it will show that various inhibited oils differ from one another in service performance much as inhibited oils differ from uninhibited ones. It will be possible, finally, to select an inhibited oil from economic considerations in which cost of the oil may be balanced against the advantages anticipated from its use.

New "MIDGET SUBSTATION" makes lamps burn brighter, last longer

G-E INDUCTROL POWER PACK

combines breaker, transformer, regulator in one convenient package

If your plant has combined light and power circuits, you may have noticed how illumination can fall off during plant load peaks. You may also have had trouble with shortened lamp life due to overvoltage.

In either case, here's a brand new "packaged" answer to better voltage regulation—the G-E Inductrol Power Pack.

The new Inductrol unit is, in effect, a midget load-center substation, combining circuit breaker, transformer, and induction voltage regulator in one convenient, space-saving package. It takes the 480 or 600 volts from your power line and converts it to the uniform 120 volts required for maximum lamp output and life. For greater production, more accurate testing, and better performance of electronic equipment, investigate the new G-E Inductrol Power Pack. Contact your G-E sales representative, or authorized G-E agent—or mail your coupon today. *Apparatus Dept., General Electric Co., Schenectady 5, N. Y.*

G-E Inductrol Power Packs on factory's roof stanchions are housed in attractive, completely metal-enclosed, easily installed cabinets.

INDUCTROL POWER PACK

General Electric Co., Section D321-73
Apparatus Department
Schenectady 5, N. Y.

Please send me Bulletin GEA-5571 on the new G-E Inductrol Power Pack.

Bulletin needed for:

..... Reference purposes

..... Planning an immediate project

NAME.....

POSITION.....

ADDRESS.....

CITY..... **ZONE**..... **STATE**.....

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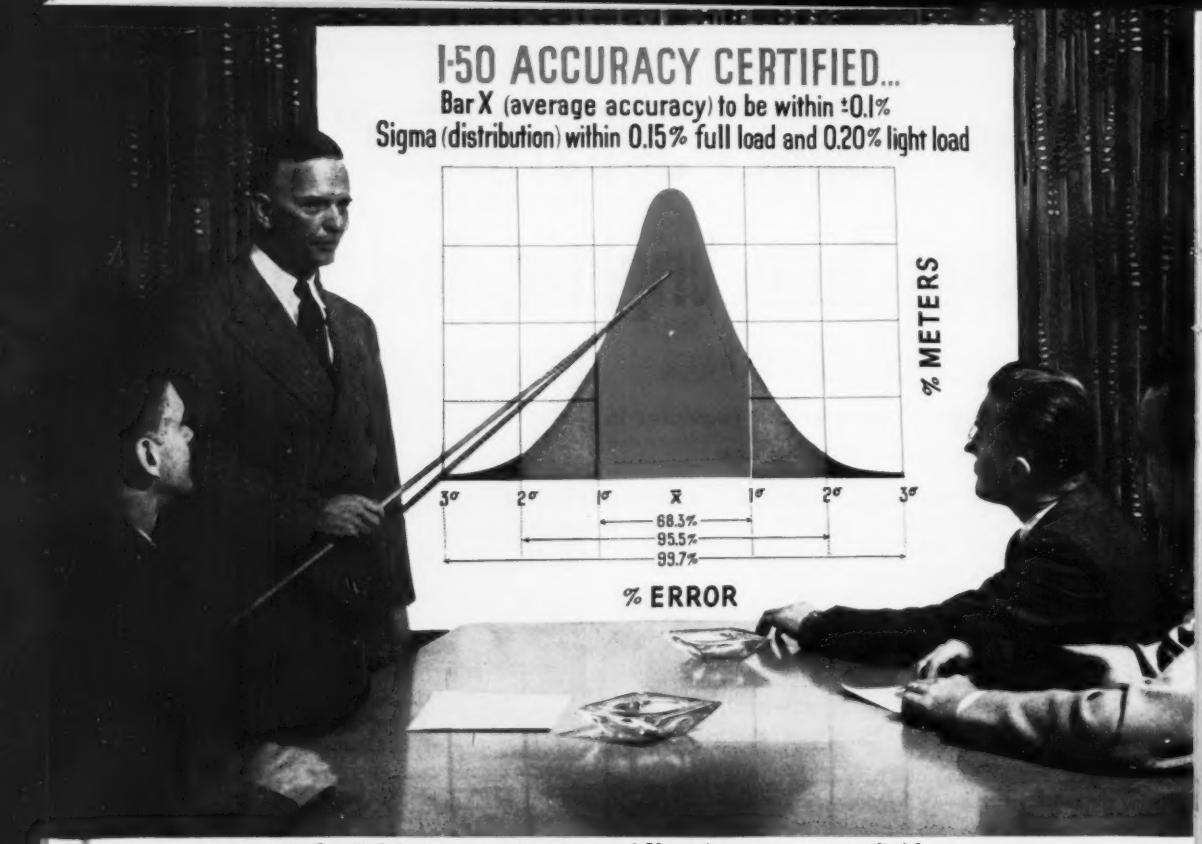


A. L. Carvill, Sales Manager, describes how I-50 watthour meters are certified for accuracy.

I-50 WATTHOUR METERS NOW CERTIFIED

General Electric factory certifies meters for accuracy and performance!

Accuracy certification is based on the new application of a simple method of evaluation that reduces calibration data to two figures: bar X ($\bar{x}$) and sigma (σ). Bar X is the average accuracy. Sigma is a quality-control term that indicates dispersion about the average. General Electric certifies I-50 meters to have left the factory with a bar X of within $\pm 0.10\%$ and a sigma of 0.15% on full-load and 0.20% on light-load.

Experience with meter-calibration data shows that when plotted, data fall on the well-known "bell-shaped" normal distribution curve. This correlation permits the use of accepted statistical methods in analyzing and describing meter-calibration data. Over-all accuracy of *any* group of watthour meters can be expressed in this way.

I-50 meters are also factory certified to be 99.9% free from defects that might cause improper registration or operation. They can be certified for performance only because they are a completely new design, embracing new materials, new techniques and methods of construction. But the smallest flaw can seriously affect both performance and accuracy of a meter! That's why there are 18 separate electrical tests and 356 points of inspection in the manufacturing cycle.

You know that all types of watthour meters are *not* alike—in either accuracy or performance. Why not compute the bar X and sigma of your meters and then compare accuracies of the different types. For complete information, fill out the attached coupon and mail it today. Apparatus Department, General Electric Company, Schenectady 5, New York.

GENERAL ELECTRIC

601-40

How I-50 meters are certified for accuracy

CALIBRATION DATA ON WATTHOUR METERS

☐ "S" METERS ☐ "A" METERS ☐ 2 WIRE ☐ 3 WIRE

SERIAL NO.	AS REC'D.--% OF ERROR F.L.	L.L.	SERIAL NO.	AS REC'D.--% OF ERROR F.L.	L.L.
28201173	3+	4-	28257758	1+	0
28202301	2+	3+	28201714	2+	3+
28256419	3+	0	28205498	0	2+
28256472	0	3+	28205422	2+	1+
28202148	2+	1+	28205487	0	2+
28205268	0	1+	28201413	3+	0
28201512	3+	3+	28201814	3+	2+
28201107	1+	2+	28205471	3+	4+
28202258	3+	3+	28205198	0	2+
28205513	2+	2+	28202648	0	1+
28205240	0	1+	28214587	2+	2+
28202508	0	2+	28207947	2+	1+
28202413	1+	0	28228181	5+	4+
28201033	2+	0+	28496432	0	1+
28215345	3+	1+	28215023	3+	0
28213867	0+	2+	28218330	1+	3+

METERS ARE CALIBRATED to extremely close limits and data recorded to nearest 0.1%. Then, total number of meters for each 0.1% of error is transferred to evaluation form.

METER EVALUATION FORM

FULL LOAD
AVERAGE ($\bar{x}$) = -.02 %
ST'D. DEV. (σ) = .13 %
NO. OF METERS = 4094

	METER ERROR IN % (x)	NO. OF METERS (n)	(nx)	(x')	(nx')
FAST (+)	0.5	2	1.0	0.25	.50
	0.4	7	2.8	0.16	1.12
	0.3	47	14.1	0.09	4.23
	0.2	265	53.0	0.04	10.60
	0.1	813	81.3	0.01	8.13
		TOTAL 2 =	152.2		
	0	1281		000	000
SLOW (−)	0.1	1035	103.8	0.01	10.38
	0.2	489	97.8	0.04	19.56
	0.3	129	38.7	0.09	11.61
	0.4	20	8.0	0.16	3.20
	0.5	3	1.5	0.25	.75
	0.6			0.36	
	TOTAL 1 = 4094	TOTAL 3 = 2498		TOTAL 4 =	70.08

$\bar{x} = \frac{\text{TOTAL 2} - \text{TOTAL 3}}{\text{TOTAL 1}}$

$\bar{x} = \frac{(152.2) - (249.8)}{(4094)}$

$\bar{x} = \frac{(-97.6)}{(4094)} = -.0238\%$

$\sigma = \frac{\text{TOTAL 4}}{\text{TOTAL 1}} - \bar{x}^2$

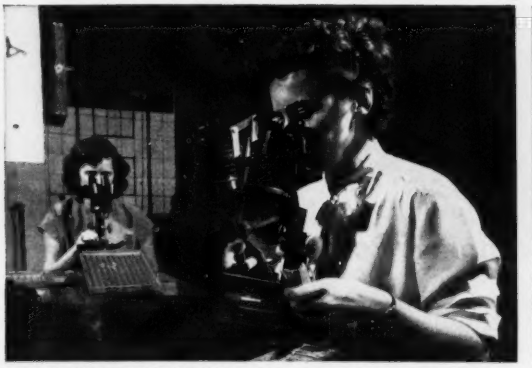
$\sigma = \sqrt{\left(\frac{70.08}{4094}\right) - (.0238)^2}$

$\sigma = \sqrt{(.017117) - (.000565)}$

$\sigma = \sqrt{(.0166)} = .13\%$

CALCULATING BAR X AND SIGMA is easy. The chart is followed through—step by step. Formula for sigma is thoroughly explained in books on statistical methods.

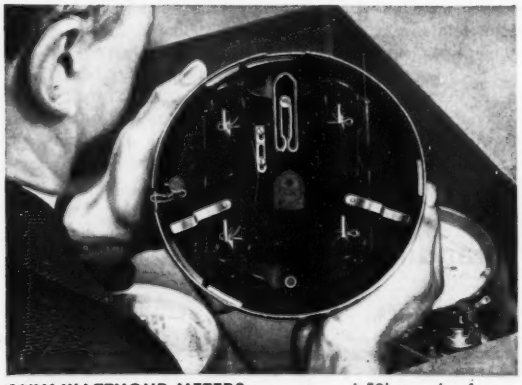
How I-50 meters are certified for performance



MICROSCOPIC EXAMINATION of graphite guide bushings, one of 356 points of inspection, checks for defects in construction. Bushing is used in magnetic suspension element.

TWENTY FINAL TEST PANELS assure uniform accuracy. Each I-50 meter is tested here for full, lag and light load. Each panel itself is checked daily for accuracy.

How do your watthour meters compare?



ONLY WATTHOUR METERS accurate as I-50's can be factory certified within these limits. Note the gold seal of certification which is attached to every certified I-50 meter.

...MAIL THIS COUPON TODAY

Sec. B601-40
Apparatus Dept.
General Electric Co.
Schenectady 5, New York

Please send me the complete descriptive brochure (GED-1408) that shows how certified meters offer additional opportunities for metering economy.

☐ **Also send a set of evaluation forms (GEZ-332).**

Name ..... **Position** .....

Company .....

Address .....

City ..... **State** .....

HOW TO DESIGN • CONSTRUCT OPERATE • MAINTAIN

TUMBLING EQUIPMENT and soaking apparatus was built up of a section of pipe with a heavy lid on the top. Trough has a screened drain allowing the connectors to be dumped out and excess solvent drained off. Internal baffles restrict tumbling

GAUGING OF CONNECTOR to see if it is sprung is followed by dipping the nut into the warm no-oxide grease at the worker's left, and screwing onto bolt. While doing the gauging, the gauge is slipped into opening while connector is held in a jig

Salvage Connectors for Economy, Possible Scarcity

J. B. BOWEN
Supt Electrical Maintenance
San Diego Gas and Electric Co

Uncertain delivery and possible curtailment of manufacture makes the salvage of items of electrical hardware worth looking into irrespective of economies. San Diego Gas and Electric has investigated the desirability of salvaging split-bolt connectors in sizes from No. 8 to 1,000 Mcm, and found it not only feasible, but profitable. Salvage cost is approximately 30-35% of new replacement cost, depending on volume handled. This represents a substantial saving in the company's annual requirement of about 115,000 connectors, costing approximately $23,000

Major problem in salvaging the connectors is removal of the weatherproof tape. It has been the practice in the past to wrap the connectors with cambric tape before applying the weatherproof, but this was not done in every case and many of the connectors were brought in badly gummed up. Overnight soaking in solvent, followed by tumbling for 30 or 40 min is sufficient to loosen the tape.

To prevent damage to the threads during the tumbling operation, baffles in the pipe section comprising the tumbler restrict motion to a slight rolling. The top is screwed down by a large nut over the center stud. Loosened tape is picked out of the tumbler by hand, leaving the connectors ready for disassembly with a box wrench. This disassembly also identifies the size if the marking is scarred or obliterated.

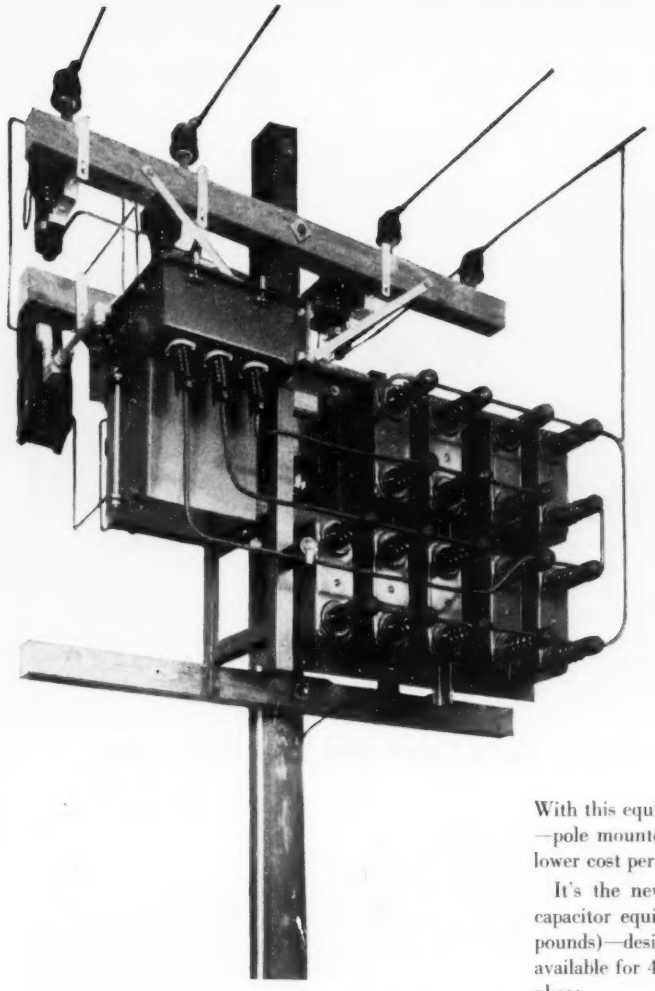
The equipment shown here is essentially experimental. Where the volume is sufficiently large better methods could be used, resulting in a lowering of the cost of salvage. Regardless of cost, it is well to know *how* to salvage as many materials as possible, whether the knowledge is used or not. Cost and savings may be less and less important under possibly impending conditions of scarce supply.

Preservative Applied to 60-ft Standing Poles for $15 Each

Two methods for applying preservatives to standing poles have been used successfully by Consumers Power Co on 50 miles of 140-kv line from Flint to Lansing, Mich. Cost for treating these 60-ft H-frame structures is expected to average under $15 per pole.

Preventing the preservative from spattering on surrounding vegetation has been the main difficulty in the past. Then, too, early investigations indicated that poles of too high a moisture content would not retain sufficient quantities of preservatives. For that reason, poles are tested with a moisture meter. Treatment is with a 5% pentachlorophenol solution in oil.

The method most extensively used



New

G-E switched capacitors for pole mounting

- **LOW COST**
- **LIGHT WEIGHT**
- **FACTORY ASSEMBLED**

The new pole-mounted equipment consists of nine 25-kvar capacitors in a steel rack equipped with cross-arm hangers; a solenoid-operated oil switch; a potential transformer; and an automatic control. The entire equipment is factory-wired and assembled—shipped as a unit, and ready for mounting when received.
Single-step automatic control, either voltage or current, is available in a separate outdoor housing for base of pole mounting where it can be easily inspected and serviced from the ground.

With this equipment you can get switched capacitors—pole mounted—for your distribution circuits—at a lower cost per kvar than ever before.

It's the new G-E open-type 225-kvar auto-switch capacitor equipment. Compact, lightweight (only 950 pounds)—designed specifically for pole mounting, it is available for 4160-, 4800- and 7200-volt circuits, three-phase.

Automatic controls are in a separate housing for mounting at the base of the pole. Inspection and servicing are easy.

Installation costs are low—the equipment is shipped completely wired and assembled. Simply mount the equipment on the pole and connect the controls.

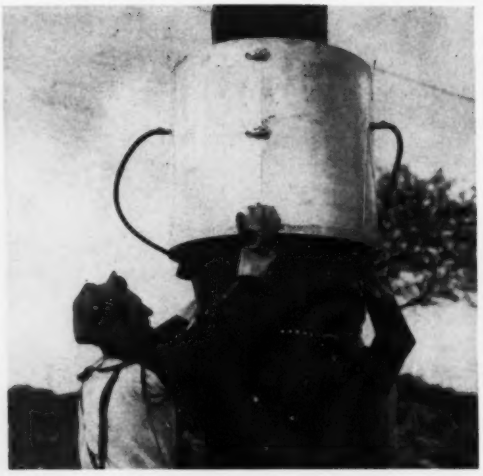
Your nearest G-E Apparatus Sales office has full information. *Apparatus Dept., General Electric Company, Schenectady 5, New York.*

407-28

GENERAL ELECTRIC

Preservative Applied to Standing Poles *(Continued)*

SPRAYING EQUIPMENT is held in the worker's right hand as he moves down, and gradually around, the pole being treated



360-DEG SPRAYING is secured using a new method still in the experimental stage. Tank is moved up from pole bottom

involves holding equipment in the right hand while the worker sprays down—and gradually around—the pole. He is protected by a special composition face shield, sleeves, gloves, trousers, and boots—all resistant to oil.

Still in the experimental stage is the use of a circular tank with spray action on the inside covering pole circumference with preservative at one time. Tank is moved up the pole.

Packaged Steel Building Cuts Cost and Erection Time

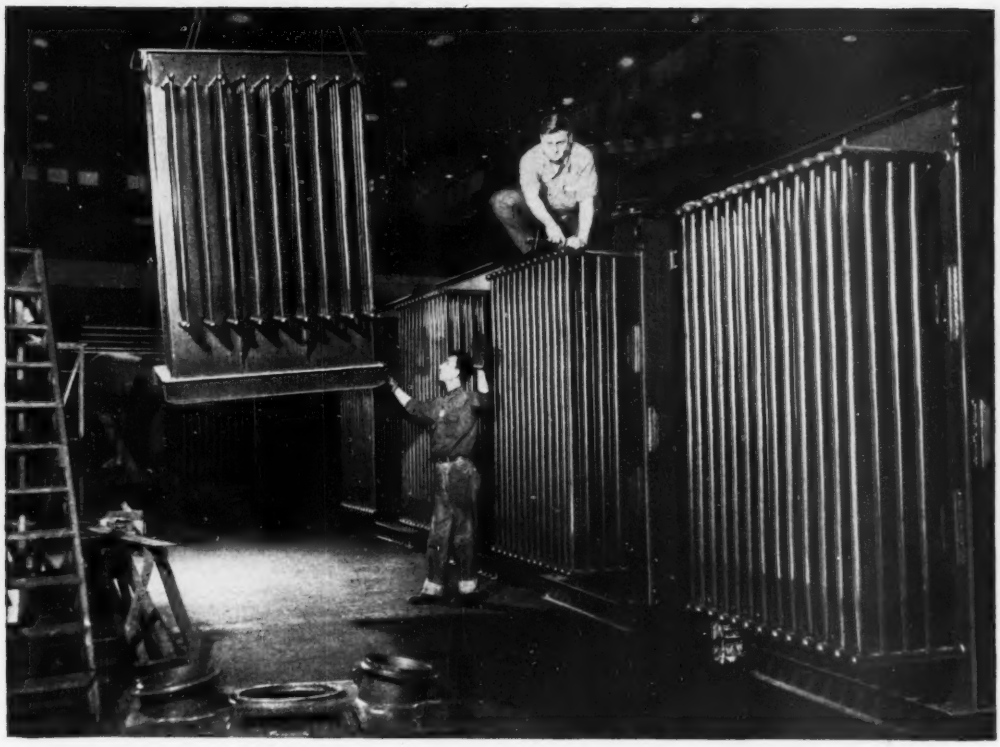
M. C. HEFFELMAN
Vice-President and Santa Fe Div Mgr
Public Service Co of New Mexico

Easily ordered, quickly built, and economically priced was a ready-made steel building recently purchased by Public Service of New Mexico for warehouse and shop space. The 24x48-ft structure was ordered as a package with foundation, material, and labor for erection. It was complete and ready for use five weeks after the order was placed. Actual construction time on the job was four days for the concrete pad to be poured and set, and two days for erection of the building proper. Only work required of the company was to prepare the building site to within two inches of final grade.

Building exterior is galvanized iron panels, supported on a steel framework. The building is completely lined with thermal and acoustical glass fiber insulation, except for eight 2x5-ft Corrulux skylights, two small doors, and a sliding end door. Inside the building is an eight-foot wainscoating of corrugated galvanized iron. Roof members are designed for loading up to 3,360 lb on the center line of the building—important for lifting required in shop work.

READY-MADE STEEL BUILDING is inexpensive and quickly erected. Only two days were needed to put up the 24x48x10-ft building for added warehousing space

Comparison of the price of the building with bids received for other types of construction favored the ready made structure by a substantial amount. Nearest bid was 30% above the actual cost of the building as erected and ready for use.



Electric Utilities step up trend to RM* transformers

let's check this

1950 purchases of RM units up nearly 81% over 1949. Need for faster shipment, flexibility, seen as basic factors

Last year, 77 different electric utilities saved an average of 4 weeks in delivery time and 8 per cent in purchase price per transformer by specifying General Electric's RM power transformers. Their total 1950 buying resulted in an 80.6% increase in orders for standardized units.

This year, too, vital time can be saved. Right now, RM shipments are from 5 weeks to 5 months shorter, and prices are 8 per cent lower than for nonstandard units of similar ratings.

Are you *sure* you realize *how much* flexibility in application you can obtain and still qualify for RM savings? "Loadability" and voltage ratios, for example, are worth checking again—particularly with the need for faster delivery being what it is.

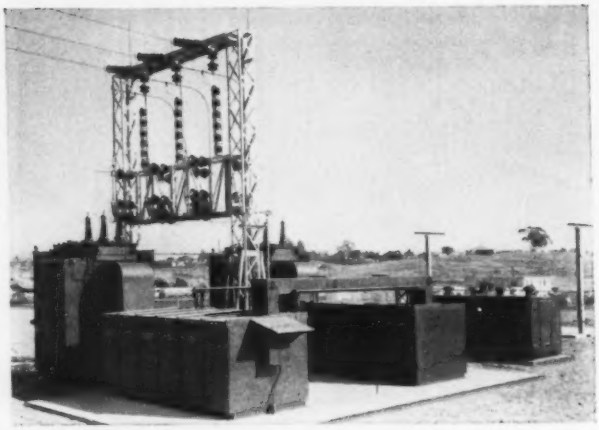
General Electric Company, Schenectady 5, N. Y.

* **"RM"** stands for Repetitive Manufacture and covers General Electric's standardized power transformers up to 10,000 kva. You can obtain many optional features—including primary voltages—and still qualify for RM price. Special engineering is eliminated on RM transformers. As a result, prices are lower, deliveries are shorter. Booklet GEC-479 contains full information.

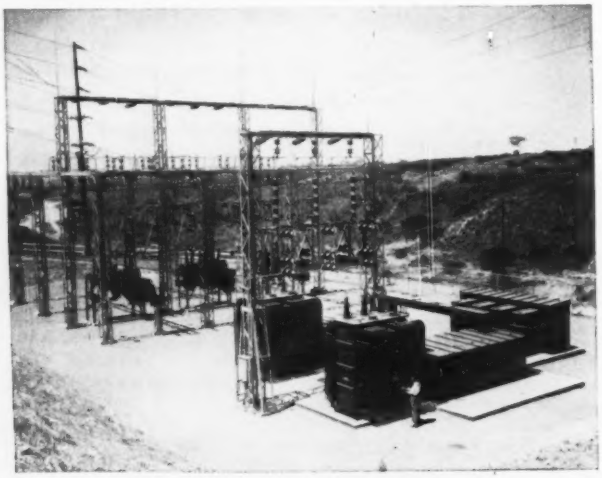
GENERAL ELECTRIC

401-47

SAN DIEGO GAS AND ELECTRIC
speeds expansion with
PACKAGE SUBSTATIONS



CHOLLAS PACKAGE SUBSTATION, rated 12,000/16,000 kva. Photograph taken from near 69-kv structure shows metal-clad switchgear, 69-kv mounting arresters and horngap switches, and the 125-volt battery house.



WABASH SUBSTATION—constructed completely from packaged equipment, including station structure. This station transforms 69-kv to 4160 volts. Equipment includes two unit substation transformers 5000-kva self-cooled or 6667-kva forced-air-cooled and four 225-kva 3-phase induction voltage regulators operated in triplex.

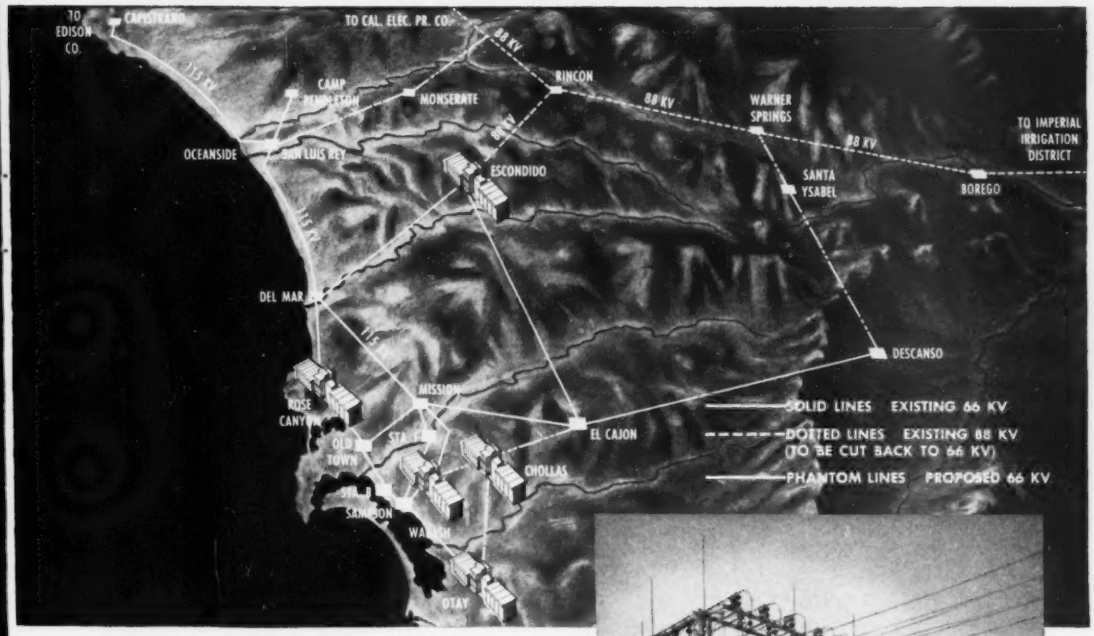
Saves engineering time, simplifies purchasing, speeds delivery to meet tremendous load growth.

Careful planning during the war years enabled San Diego Gas and Electric Company to expand its postwar system with exceptional speed—to meet the huge 350 percent increase in load. Additional generating capacity was the first consideration. But new substation capacity was also urgently needed to relieve badly overloaded equipment and to correct low-voltage conditions on parts of the system. Why did they standardize on **package** substations? Here's what they say:

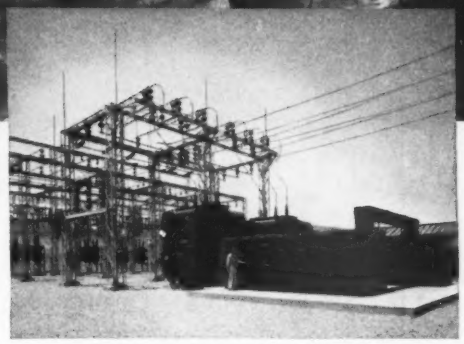
"This method of purchasing minimizes the engineering required since a single set of brief specifications outlining functional requirements is all that need accompany the single purchase order. Ordering all of the equipment from one manufacturer further reduces the engineering time required. It places on the manufacturer the responsibility of co-ordinating all of the various items of equipment and of supplying a workable substation, complete with installation, over-all arrangement, and over-all connection drawings. It frees the utility engineer from the details of co-ordinating and expediting and makes his time available for system planning where he can make more valuable contributions."

These considerations were important to the San Diego Gas and Electric Company. It permitted them, even with a small engineering force, to place orders promptly for complete substations, securing early places in the production schedules.

Apparatus Department, General Electric Company, Schenectady 5, New York.

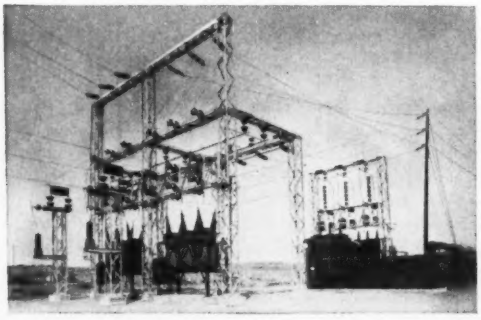


This map shows the planned expansion of the 69 kv transmission system of the San Diego Gas and Electric Co. New package substation locations are shown in red. Substations are functionally similar and made up of standard-design components, the main differences being in secondary voltage and type of regulation. Photographs of the package substations appear on these pages.



(Above) **ESCONDIDO SUBSTATION,** comprising two 3-phase, 66-kv to 12.47-kv, 6000-kva transformers and complete station structure.

OTAY PACKAGED SUBSTATION, rated 12,000/16,000 kva, transforms 69-kv to 12.47-kv. Photo shows current line traps (left) and large outdoor oil circuit breakers, also at left. At right, the transformers, switchgear, Thyrite* station-type arresters, etc.



(Below) **ESCO PACKAGED SUBSTATION,** including induction voltage regulating equipment and a 3-phase transformer rated 3000-kva self-cooled at 12,470/3,430 volts, Y/2,500 volts.

GENERAL ELECTRIC

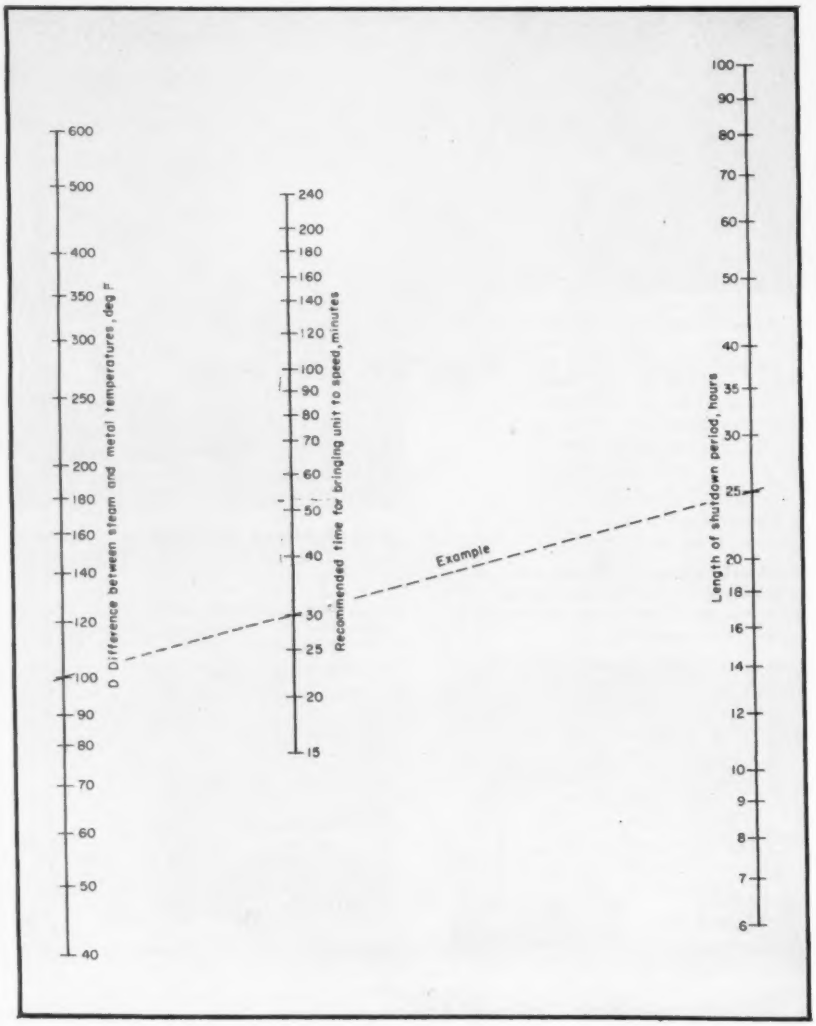
321-72

*Reg. Trade-mark, General Electric Co.

Time to Bring a Steam Turbine To Speed Following Shutdown

Recommended time can be determined for bringing unit to speed following a shutdown period during which turbine has not been dismantled. Data required is (1) Difference between steam and metal temperatures at starting time and (2) length of shutdown period. An example for starting time is shown. This nomogram can be used widely regardless of age and size of turbine

ROBERT L. REYNOLDS, Manager, Central Station Turbine Section, Westinghouse Electric Corp, South Philadelphia, Pa.



Adapted from a paper "Feasibility and Economics of Quick Starting of Steam Turbines" by the author. Presented before Production Committee of Engineering and Operation Section, Southeastern Electric Exchange at Atlanta, Ga.

Cu 70% + Ni 30%

THE UNBEATABLE COMBINATION AFLOAT *

A main condenser for MSTS Transport President Hayes in the shipyard of the New York Shipbuilding Corporation, Camden, N. J. Revere Cupro-Nickel Tubes (30% nickel) are used. The tube plates are Muntz Metal.

*AND WHEREVER ELSE CONDITIONS ARE EXTRA DIFFICULT

CUPRO-NICKEL is the preferred alloy for condenser tubes in marine use because of its superior resistance to the corrosive influences of sea and harbor water, the latter usually contaminated with extremely active industrial and sewage wastes. Thus it is natural that cupro-nickel, 30%, is being used for the tubes in three vessels now being completed by the New York Shipbuilding Corporation, Camden, N. J. These ships were originally ordered for the American President Lines, Ltd., for passenger and cargo service, but subsequently taken over for military service. The builder constructed the condensers at its yard, and Revere furnished the tubes and plates.

In addition to cupro-nickel, Revere also makes tubes and sheets in other alloys, such as Admiralty, Muntz Metal, Naval Brass, Aluminum Bronze, etc. Choice of the correct alloy depends on the conditions it must encounter. Revere will gladly collaborate with you on matters involving condensers and heat exchangers.

REVERE 150th YEAR OF SERVICE TO AMERICA

COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

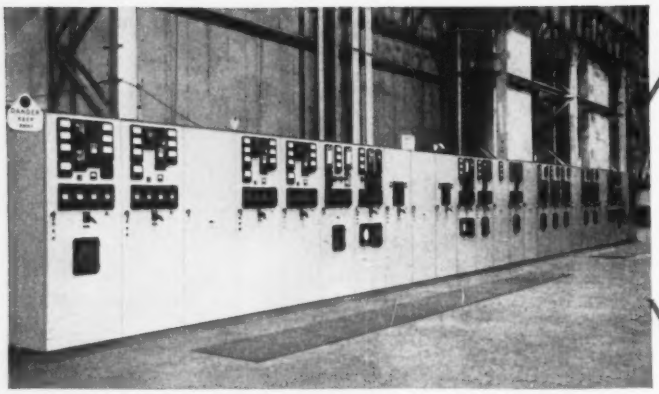
230 Park Avenue, New York 17, N. Y.

• • •

Mills: Baltimore, Md.; Chicago and Clinton, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Rome, N. Y.— Sales Offices in Principal Cities, Distributors Everywhere

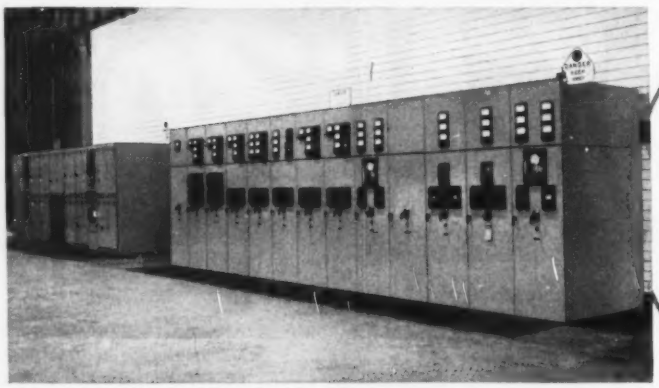
SEE "MEET THE PRESS" ON NBC TELEVISION EVERY SUNDAY

WORLD'S FIRST CONTINUOUS
Gets ALLIS-CHALMERS



Metal-clad switchgear with vertical lift Air Blast circuit breakers controls 13,800 volt incoming power for the new mill and distributes power for m-g sets and rectifier transformers.

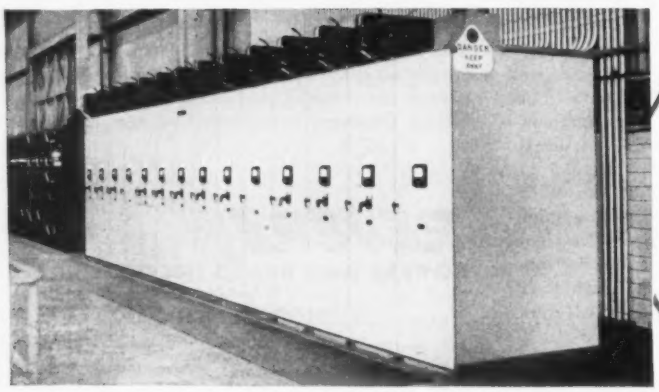
Other Allis-Chalmers equipment includes a 4000 kw m-g set and *Regulex* control for a reversing mill, a 4000 kw m-g set for a continuous billet mill with 1250 hp motors and *Regulex* variable voltage control and an 8000 kw synchronous m-g set and six 1750 hp dc motors with *Regulex* control.



This 13 unit lineup of 2300 volt metal-clad switchgear on the right, with 150,000 kva *Ruptair* magnetic air circuit breakers, protects an Allis-Chalmers m-g set and other motors on a 36 inch bar mill.

The 480 volt metal enclosed switchgear with G-25 air circuit breakers (on the left), is used for lighting and auxiliary purposes.

2300 volt metal-clad switchgear (not shown) distributes power to a 46 inch blooming mill and bloom shear drive.



This 250 volt dc switchgear with cathode and feeder circuit breakers takes power from two 1500 kw excitron rectifiers and distributes it for auxiliary equipment in mill supply.

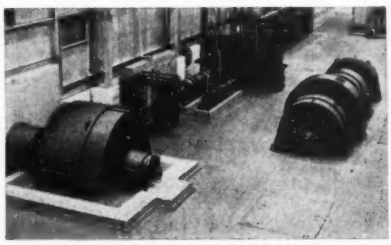
Hundreds of motors, pumps and other electrical equipment turn out round steel billets 5½ inches in diameter and from 3 feet 9 inches to 14 feet long.

PIPE PLANT
Switchgear Protection

All Power for National Tube's Blooming, Bar and Billet Mill Flows Through Allis-Chalmers High and Low Voltage Switchgear

NATIONAL TUBE'S 3 year expansion of its vast steel and pipemaking facilities in Lorain, Ohio, boosted its production of seamless pipe to 18,000 tons a month. This first-of-its-kind plant is unique in its automatic production of seamless pipe.

To protect expensive electrical equipment in their modern, virtually automatic Blooming, Bar and Billet mill, National Tube chose Allis-Chalmers switchgear protection. Continuous production of large tonnages of billets used in the manufacture of seamless steel pipe demanded continuous power.



Each stand of this 6-stand continuous billet rolling mill is driven through gearing by an Allis-Chalmers 1750 hp dc shunt motor which receives power from a m-g set made up of 2000 kw dc generators.

Complete protection for equipment at the Blooming, Bar and Billet mill comes from three types of Allis-Chalmers switchgear:

1. Metal-clad switchgear with 500,000 kva air blast circuit breakers, used for motor starting, distributes incoming 13,800 volt power.

2. Metal-clad switchgear, rated 2300 volts, has 150,000 kva *Ruptair* magnetic air circuit breakers used for full voltage starting and protection of 200 to 900 hp motors.

3. Metal enclosed 480 volt drawout type switchgear is used for protection of small motors and auxiliary equipment.

This completely protected Blooming, Bar and Billet mill is another one of many applications of standard Allis-Chalmers switchgear . . . an investment in dependable circuit protection.

Standard A-C metal-clad switchgear is built for maximum protection to personnel and equipment. Grounded steel barriers isolate circuit breakers, transformers and high voltage buses.

Choose any type of circuit breaker: *Ruptair* air magnetic, Air Blast or Oil. The self-contained *Ruptair* air magnetic breaker gives rapid circuit interruption because it combines natural thermal effect of the arc with a strong magnetic blow out field. It's oilless and self-contained.

The Air Blast circuit breaker is designed for severe repetitive duty requirements and is furnished in standard vertical lift switchgear. Both the operating mechanism and arc interrupting devices are air operated from the air storage system.

There is a standard Allis-Chalmers switchgear unit to fit your application. Prefabricated and easy to install. Installation costs on A-C standard switchgear are low and predictable . . . in any application, industrial or utility. Meets NEMA and ASA standards of safety and performance.

For more information about Allis-Chalmers switchgear contact your local A-C sales office. Or write Allis-Chalmers, Milwaukee 1, Wisconsin, for bulletin 18B6195.

A-3274

Regulex and *Ruptair* are Allis-Chalmers trademarks.

ALLIS-CHALMERS

First in the U. S. with Metal-Clad Switchgear

BACKFILLING BLADE ATTACHMENT on this jeep shortens the period of traffic interference where street excavating work is being done. Labor expenses are drastically reduced

ROTARY BROOM driven from jeep engine is interchangeable with the blade, sweeps up after the backfilling is completed. Sprinkler head using water from tank in rear keeps dust down

Reduce Backfilling Costs with Jeep Blade and Broom

J. R. KELLEY
Engineer of Underground Construction
Los Angeles Dept of Water and Power

Use of a jeep with bulldozer and rotating broom attachments has cut the cost of backfilling and cleaning up behind construction crews by as much as two-thirds for the Los Angeles Department of Water and Power. Savings paid for the equipment in less than five months.

The jeep is made to order for the many light jobs previously performed by manual labor in preference to bringing in cumbersome heavy equipment. Unlike the heavy equipment, the jeep can go quickly and easily from one job to another and work at several different, and sometimes widely scattered, locations during the same day. To travel between locations requires only that the broom be lifted and latched a few inches above the pavement. Caster wheels take the weight, allowing complete freedom of movement at normal driving speeds through traffic.

Change Attachments in 15 Minutes

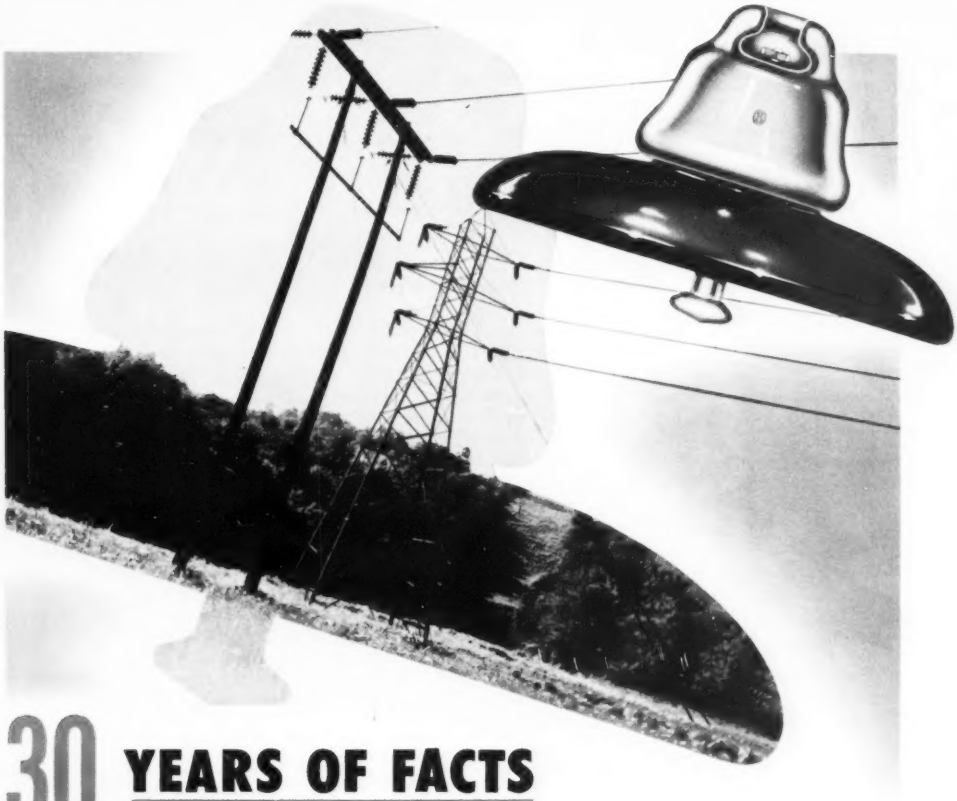
Attachments can be changed on the job by the operator in 15 min. The blade is adjustable for straight ahead or two angle positions on either side. Both blade and broom can be raised and lowered from the jeep cab by a hydraulic system control. After the backfill has been completed the rotary broom sweeps the surface, and is stiff enough to make a cut for temporary paving on top of the backfill. Broom is driven by the jeep engine through a clutch and separable shaft, and is narrow enough to get into small areas, such as driveways, which, under ordinary circumstances, have to be swept by hand.

With this unit and one operator, a ditch 365 ft long, 18 in. wide and 4 ft deep was backfilled in three hours, compared to 56 man-hours which would have been required by hand labor. A clean-up job which would have required 40 man-hours was completed in two hours—at an estimated saving of $32. Flexibility and mobility of the equipment also help keep to a minimum the time required for such operations, and therefore shorten the period of traffic interference.

Pit Helps Position Power Package

REAR WHEELS OF THIS TRAILER were backed into a pit bull-dozed deep enough to bring the trailer bed level with the concrete pad on which the unit substation was to be placed. A two-ton hoist snubbed to the 12/2.4-kv unit slid it into place. Gene Dais, foreman, Utilities Dept, reports that the City of Redding (Calif.) thus handled the 2,000-kva unit without a crane or other special facilities

HI-TENSION NEWS *Junior*



30 YEARS OF FACTS

to Guide Your CHOICE OF INSULATORS

For nearly 30 years, the O-B insulators on these two lines have withstood worse-than-average conditions of storms and ice loadings in a mountainous eastern district. Today, they show every evidence of being as good as the day they were installed.

Naturally, the power company need not look beyond its own records when performance becomes the basis for further insulator purchases. Nothing *we* might say could alter hard facts -- and these facts point to O-B for proved-out assurance of satisfaction.

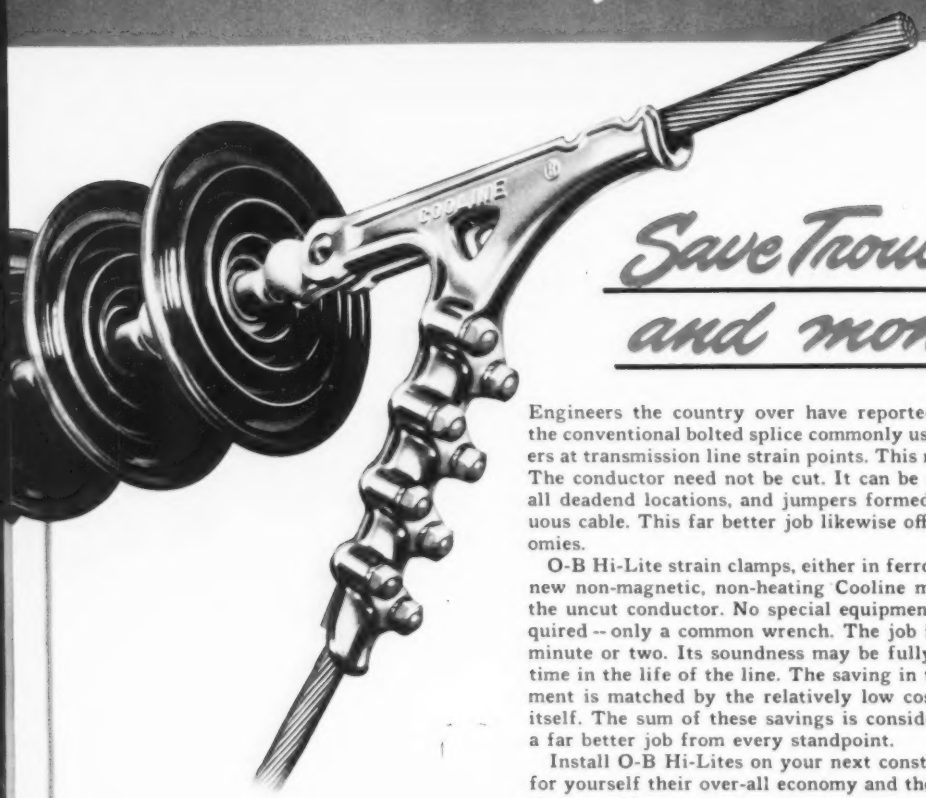
Much merit can be *claimed* for O-B insulators, but the *facts* stand on the records of hundreds of power companies -- you can't match O-B for downright dependability. We invite you to check this statement; then buy on the basis of your biggest money's-worth.

Ohio Brass

MANSFIELD, OHIO, U.S.A.

(B)

HI-TENSION NEWS *Junior*



Save Trouble and money

Engineers the country over have reported trouble from the conventional bolted splice commonly used in the jumpers at transmission line strain points. This needn't happen. The conductor need not be cut. It can be strung through all deadend locations, and jumpers formed in the continuous cable. This far better job likewise offers many economies.

O-B Hi-Lite strain clamps, either in ferrous metal or the new non-magnetic, non-heating Cooline model, attach to the uncut conductor. No special equipment or skill is required -- only a common wrench. The job is a matter of a minute or two. Its soundness may be fully inspected any time in the life of the line. The saving in time and equipment is matched by the relatively low cost of the clamp itself. The sum of these savings is considerable. And it's a far better job from every standpoint.

Install O-B Hi-Lites on your next construction and see for yourself their over-all economy and the improvements they provide.

ALIKE...

Just One Day

Lower Tolerances... More Protection!

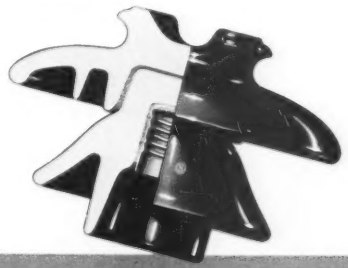
● You add tolerance to published average lightning arrester ratings to obtain a true protective value. But, this can be said a different way -- you actually *deduct* tolerance from the protective margin existing between published arrester averages and minimum insulation strength of the apparatus. With some equipment, due to length or severity of service, there is little protective margin to spare!

O-B Thorex valve type lightning arresters have the lowest tolerances ever offered on the American market; less than +10 per cent of sparkover, and less than +5 per cent of IR discharge voltages. They give you better protection because they absorb the least protective margin in terms of tolerances. For modern safety measures, equip your vital apparatus with O-B Thorex arresters.

STOP Lightning Damage

You can't keep lightning *away* from a pintype line. When it reaches an insulator, it has two choices -- to go around it *or through it!* In one case, power service continues. In the other it means a long interruption and sometimes difficult detection as well as costly repair.

There was once a day when lightning sometimes took the short-cut through an insulator. That day ended, however, with modern research tools in skilled hands. Every O-B design has been tested exhaustively, revised if necessary, and made fully lightning-resistant. Some users are not fully aware of this development in O-B's pintype line. Every O-B pintype has had lightning trouble designed out of it, as proved in the laboratory and in service. This is one more reason why your pintype circuits should be built with O-B insulation.



SINCE they are built to rigid standards, all station insulators are alike -- *just one day in their life*; the first! But the last day is when you count your money. That's when you know whether you got a bargain. Granted, station insulators start alike, but 20 or 30 years later the story is different. Your own experience will confirm this.

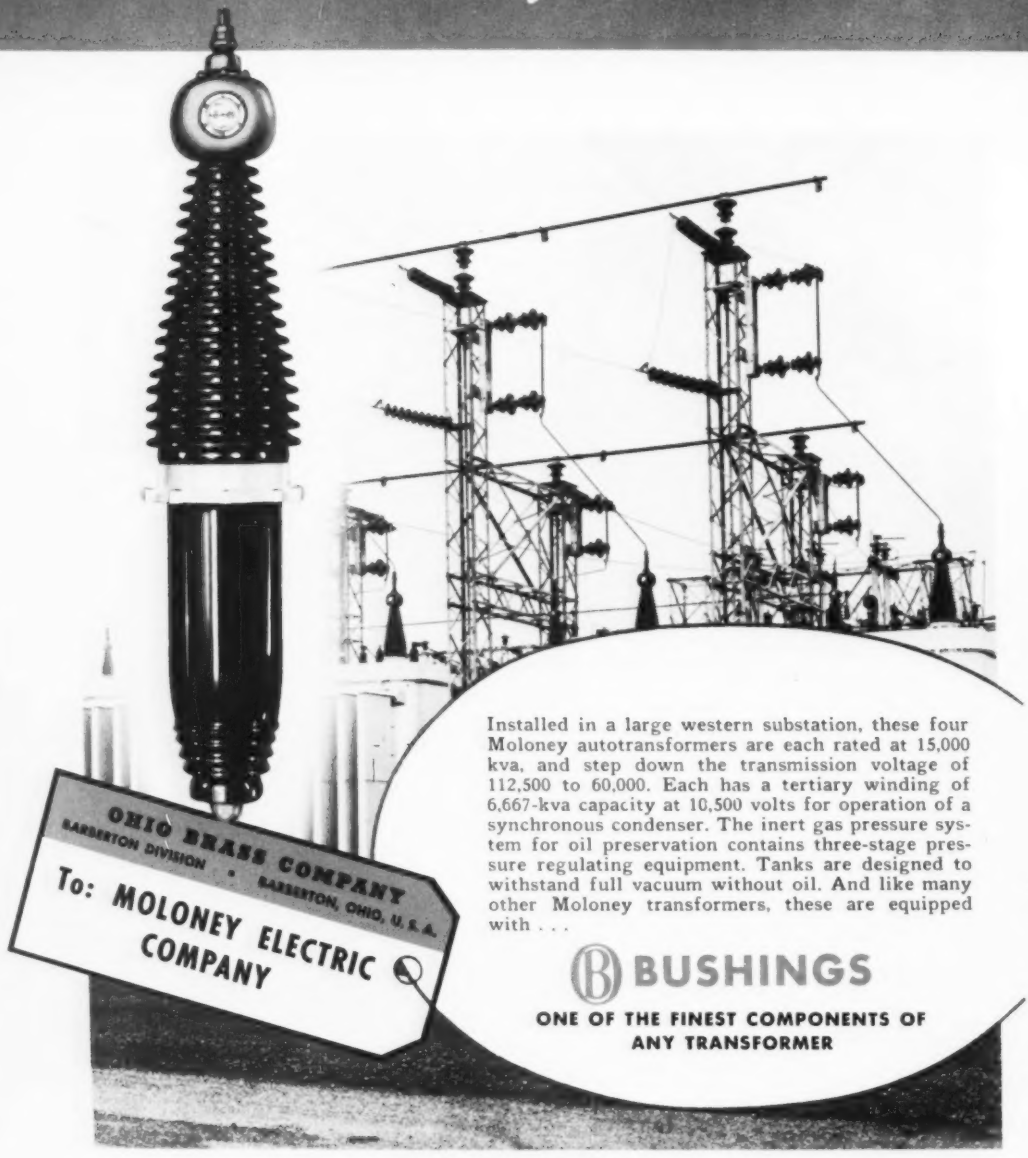
And, speaking of experience, most installations of O-B station insulators are repeat orders, based on the company records and experience of the buyer. These men have found out that, after 20 or 30 years, O-B insulators still meet every service requirement. They have learned that there really *is* such a thing as a bargain in insulation as soon as time enters the picture. For ultimate economy, write O-B into your station specifications.

Ohio Brass

MANSFIELD, OHIO, U.S.A.

OB

HI-TENSION NEWS *Junior*



Installed in a large western substation, these four Moloney autotransformers are each rated at 15,000 kva, and step down the transmission voltage of 112,500 to 60,000. Each has a tertiary winding of 6,667-kva capacity at 10,500 volts for operation of a synchronous condenser. The inert gas pressure system for oil preservation contains three-stage pressure regulating equipment. Tanks are designed to withstand full vacuum without oil. And like many other Moloney transformers, these are equipped with . . .

BUSHINGS

ONE OF THE FINEST COMPONENTS OF ANY TRANSFORMER

Ohio Brass

MANSFIELD, OHIO, U. S. A.

4119-H

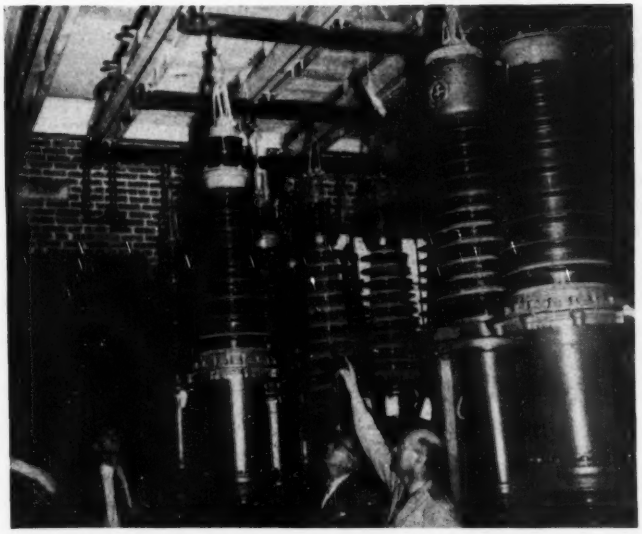
Diesel Generation Costs in 1949

Data compiled by the ASME subcommittee on oil and gas engine power costs for 1949 show that total cost of generation (not including fixed charges) averages 17.68 mills per net kwhr with a low of 5.72 mills. This is for 83 of the 122 slow-speed stationary plants for which detailed data are given. The 122 plants comprise 448 engines totalling 432,000 rated bhp in utility (24), municipal (19), water pumping (20), industrial (8), cooperative (7), public power district (3), sewage treatment (1) service. The 82 plants for which data are tabulated below had 312,544 hp altogether.

Production Costs in Diesel Plants in 1949—Mills Per Net Kwhr

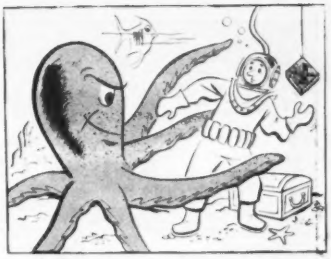
	Plant Rating		
	Minimum	Maximum	Average
	140 hp	13,370 hp	3,860 hp
Fuel Cost	2.21	15.00	8.23
Lubricating Oil Cost	0.06	2.36	0.52
Attendance, Superintendence	0.66	105.55	5.27
Supplies (incl. water)	0.04	16.88	0.80
Engine repairs	0.08	45.16	1.94
All other repairs	0	23.21	0.68
Total	5.72	183.89	17.68

Barn Door Hangers Aid Bushing Storage



DOOR HANGERS' USE in bushing storage is explained by J. B. Brown and J. E. Chapman of Duke Power Co to Frank Innes of "Electrical World"

Door hangers, of the heavy duty type used for barn doors, facilitate storing and handling of all types of bushings in the storage room of the Duke Power Co, Charlotte, N. C. Sliding tarpaulin drop doors enclose the room to increase effectiveness of a 3-kw unit heater mounted on the floor. The purpose of this heater is to eliminate condensation on the bushings. Above, J. B. Brown, test foreman, and J. E. Chapman, superintendent of maintenance and construction for Duke Power Co, explain use of the hangers to Frank Innes associate editor of "Electrical World."



You can do a lot

with a little

GOLD SEAL TAPE

Wet or dry, hot or cold, in any weather, Gold Seal sticks to the job. Tears without raveling. Gives tighter, longer lasting joints. Ask for Gold Seal Tape—you'll save time and trouble. Buy it by the carton (10 rolls) or in single rolls. Jenkins Bros. (Rubber Div.), 100 Park Ave., New York 17, N. Y.

JENKINS

Gold Seal Tapes

FRICTION and RUBBER TAPES

MADE BY JENKINS BROS.

MAKERS OF FAMOUS JENKINS VALVES

A few years back, all switch and bus units were made with a short second shell which invited the possibility of cascading in stacks. That is, up until Pinco introduced the revolutionary new L 735 switch and bus stacking unit. With rugged porcelain, a larger second shell and an improved center design, this new unit showed far superior flashover performance and greatly reduced the tendency to cascade. It also provided added leakage protection and increased mechanical strength.

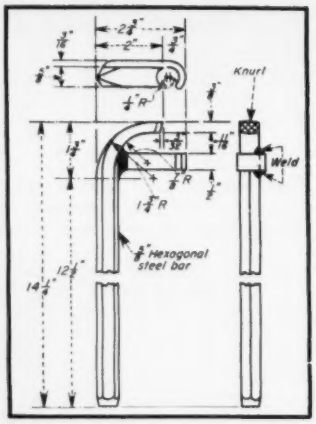
Today, this idea like many others pioneered by Pinco, is an accepted industry standard . . . further evidence that Pinco is constantly primed to keep abreast of industry requirements. So whether your insulator requirements are ordinary or extraordinary—the services of the entire Pinco organization are yours to command.

See Page 118 Pinco Catalog No. 49
for complete electrical and mechanical specifications.

The Porcelain Insulator Corporation
761 Main St., Lima, N. Y.
Sales Agents: JOSLYN MFG. & SUPPLY CO.
Offices in Principal Cities

PINCO INSULATORS

Suspension Insulators . . . Switch and Bus Insulators . . . Distribution Clamps . . . Distribution Pin Types and Guy Strains . . . Transmission Line Fittings . . . Tree Insulators . . . Transformer and Circuit Breaker Bushings . . . One Piece and Multi-part High Voltage Pin Types . . . Suspension and Strain Clamps . . . Indoor Bus Support Porcelain . . . Lightning Arrester Porcelain.



RACK PINS are easily removed by using this tool of tempered steel

Grip Tool Removes Pins from Racks

R. L. BOCCUTI
Groundman, Distribution Dept
The Ohio Power Co
Canton, Ohio

A two-prong tool easily removes service rack pins without tugging and straining by the lineman. This tool is provided on all line trucks in the Canton District. Dimensions of the tool are illustrated.

Before removing a rack pin, all stress must be taken off the spools by rope slings and takeups. This will prevent the spool snapping out of position, with accompanying hazards.

To remove a rack pin, the fingers of the tool are slipped around the pin just above the lower spool. A little outward pull on the bottom of the tool makes the fingers grip the pin, so it can be forced up through the spools and spacers by tapping the bottom of the tool with a hammer. When the upper finger reaches a spacer, the tool can be slid down the pin and the process repeated there or at an upper point on the pin.

In addition, this tool is handy for such jobs as removing mast-arm bolts or other bolts that are customarily forced out by a drift pin or another bolt. The bolts are forced out far enough by usual methods to grip them with this tool, which completes the removal. This tool also has advantages over use of a drift pin to drive the rod out of the spools since the rod is always under control, and eliminates jamming of the drift pin in the rack.

another . . .

LIMITORQUE Advantage

Can be Mounted At any Angle

Because LimiTorque Valve Controls are completely mechanical in construction, they can be installed and will function with equal satisfaction, efficiency and dependability in any desired position. No adaptations or compensations are necessary for any angular positioning. There are many valve locations where this LimiTorque feature is not only desirable but vital.

LimiTorque Controls are suited for any make and type of valve and can be actuated by any available power source.

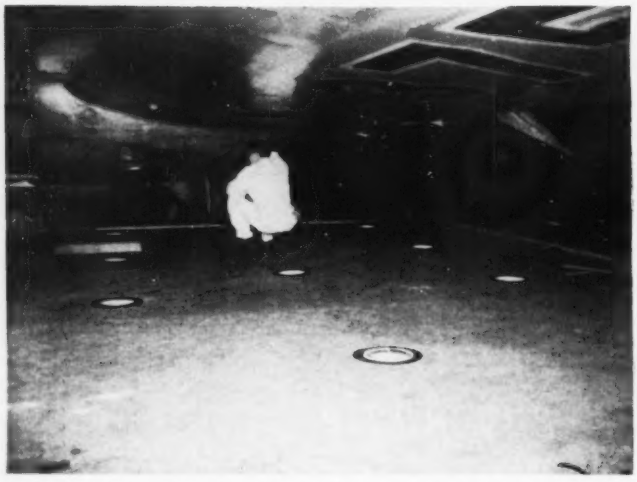
Your valve manufacturer can supply them.

Send for our 96 page catalog. Please make request on your business letterhead.

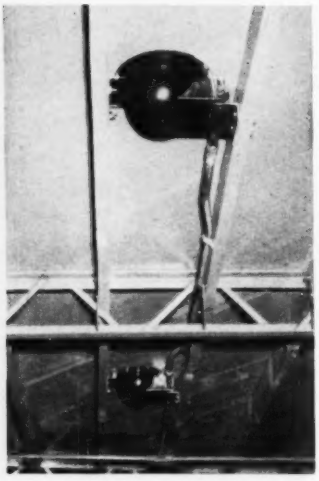
Philadelphia Gear Works, INC.

ERIE AVE. AND G ST., PHILADELPHIA 34, PA.
NEW YORK • PITTSBURGH • CHICAGO • HOUSTON
IN CANADA: WILLIAM AND J. G. GREEY LIMITED, TORONTO

Industrial Gears and Speed Reducers
LimiTorque Valve Controls



FLOOR LIGHTS flush in maintenance dock increase ease of aircraft maintenance and inspection. Special heat treated lenses resist both impact and static load



LIGHT BOXES underneath dock floor showing the conduit connections

Flush Floor Lights Aid Aircraft Maintenance

Flush lights built into the floors of the huge maintenance docks of United Airlines at their San Francisco and LaGuardia Airport Bases, flood the undersides of the DC-6 wings with a high intensity of light which is also reflected from the wings to other surfaces of the aircraft. This high level illumination makes inspections easier and maintenance work faster and more accurate. The lights are spaced symmetrically at frequent intervals and are not damaged by walking or standing on them. Tools of other articles dropped on them will cause no damage. The lamp receptacle brackets are adjustable for 100, 150 or 200-w standard lamps.

Surface Raceways Give Balanced Circuiting, Easy Expansion

Balanced circuiting and flexibility of power distribution have resulted from the installation of eight 100-ft lengths of surface raceways in the Russ Dawson, Inc, garage at Highland Park, Mich. The raceways are spaced 10 ft apart and have electrical receptacles installed at 10-ft intervals along the duct. Additional circuits can be made available within 5 ft of any point in the garage. This can be quickly accomplished by fishing the additional circuit, cutting a section out of the snap-on steel cover, inserting the needed receptacle and then snapping a new cover plate in place.

National Electric Products Corp photo

FLEXIBILITY and easy expansion are featured in this surface raceway distribution system. Garage has eight 100-ft long duct runs spaced on 10-ft centers. Drop ends, chains, boxes, and conduit used to space fixtures have been eliminated

This Tap Changer Story began

20 YEARS ago . . .

Straight Line FACTS

Purchasers of transformers are extremely interested in tap changer design because the failure of a tap changer can cause the failure of a transformer.

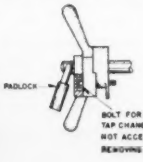
Twenty years ago Pennsylvaina Transformer Company developed the Straight-Line Tap Changer and began using it in all Power Transformers. Succeeding years brought modifications and improvements but, in essence, the present Straight-Line Tap Changer is the same as the one introduced in 1930.

For twenty years the Straight-Line Tap Changer has functioned in all types of Power Transformers under all operating conditions.

Not once in all this time has there been any reason to question the fundamental principles of the Straight-Line design.

The performance record of the Straight-Line Tap Changer is adding to the reputation of Pennsylvania Transformers. It is one of the reasons for the confidence put in Pennsylvania by a growing number of leading Utilities that are placing important orders for Pennsylvania Transformers.

Operating handle issues through side of case and is provided with a positive locking mechanism.

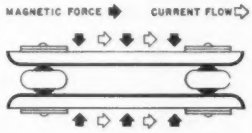


1. Flexible steel spring construction and straight line motion of movable jaw assures a self-aligning, high pressure contact at all times.

2. All contacts made of a time-tested silver-nickel mixture which possesses the electrical qualities of silver but is inert to chemical reactions. Contacts are pressure and temperature treated for high conductivity and high resistance to wear.

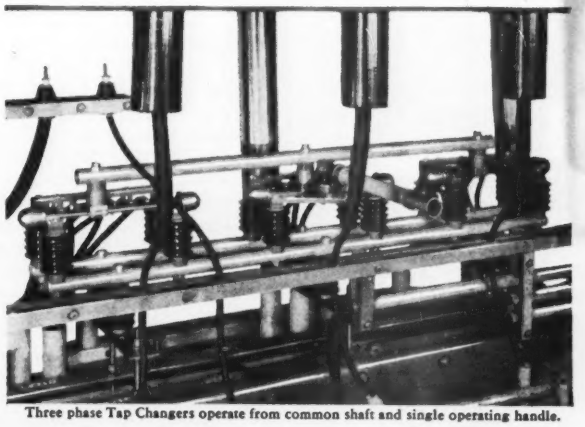
3. Contacts are self-cleaning. Each operation of tap changer results in a positive wiping action.

4. Straight Line Tap Changer withstands dead short circuits. Design of Tap Changer is such that magnetic forces cause moving contacts to increase pressure during short circuits. There is no blow-off action.



5. Transformer cable leads crimped to ends of stationary jaws. Crimping provides a high quality mechanical and electrical connection without possibility of crystallization due to brazing.

6. Tap Changer located in top section of tank — above core and coils — where it is accessible through handholes or manholes for simplified inspection and maintenance.



Three phase Tap Changers operate from common shaft and single operating handle.

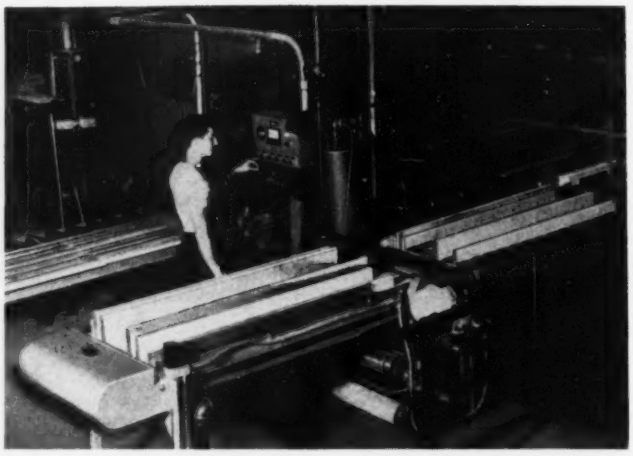
Pennsylvania TRANSFORMER COMPANY

CANONSBURG, PENNA. • Greater Pittsburgh District

Glue Curing Speeded with Automatic Dielectric Heat

The bonding of stock panels by dielectric heat has been made completely automatic at the Rway Furniture Co, Sheboygan, Wis. This is claimed to be the first installation of its kind. Glue lines are evenly and rapidly cured. The output rate is up to 10,000 sq ft of stock in a 2-shift, 18-hr day. The operators' only duty is to load the feed belt and remove the finished panels—once the integrated equipment is started up.

Equipment includes glue spreader, layup machine that eliminates manual handling of the boards, and the press. Time cycles range up to 40 sec depending on the stock. Panels can be bonded in multiple lengths or widths, or both.



Thermex Division—The Girdler Corp photo

STOCK PANEL BONDING operation using 27-kva (input) dielectric heating unit, increases output rate to 10,000 sq ft of stock in an 18-hr dry. Glue lines are evenly and rapidly cured. Operation is completely automatic and manpower is saved. Less than five minutes is needed to change set-up for different sizes

Operations Involved

Here are the production sequences:

1. The individual boards for one or any number of panels are placed on edge on a belt that conveys them to the glue spreader. There, glue rollers apply the adhesive while stock is in transit. The spreader incorporates a water cooled glue reservoir and glue pot, which keeps the adhesive at optimum consistency; roller chains that travel on bronze wear strips; slip clutches to prevent breakage; and an electrical system interlocked with the press and high frequency generator which is meant to assure proper flow of work.

2. The glue rollers pass the boards along to a pusher which turns them on their sides and deposits them on cross feed chains. The chains move the stock on to the feed table and reassemble it into panels for bonding.

3. As the feed table ram starts forward the cross chains drop below the table level. The panels are pushed into the press, simultaneously ejecting the previously cured load.

4. The press is closed and the glue lines are cured with heat generated by a 27-kva (input) high frequency generator.

The set-up time, when sizes of the load are to be changed, is less than five minutes.

INDUSTRIAL BRIEFS

Water Pumping with an 800-hp motor driven pump at Phoenix, Arizona, booster station saved an estimated $330,000 over installation cost of a proposed new pipeline required to boost daily water supply 20,000,000 gal. The saving in critical material required by the new pipeline was tremendous. Booster station was needed to supply 11,000 new customers from supply source.—General Electric Co.

Moisture Removal by infrared heat from small stone particles used in making asphalt coated roofing paper at the Becker Roofing Co, Chicago, increases adhesion and saves material and labor. Infrared tunnel has two rows of sixty 250-w infrared lamps covering and enclosing 16 in. wide by 40-ft long conveyor belt which carries stone continually under them at approximately 120 F and speed of 150 ft per min. Lamps are divided into four separately controlled circuits to allow temperature variations.—M. G. Slawin, Commonwealth Edison Co, Chicago.

Food Warming is accomplished with radiant infrared heat at Green Arrow Park & Eat, Willow Grove, Pa. Food orders have no opportunity to cool off while waiting on counter for waitress to pick up. A 1,500-w heating unit, 40 in. long, mounted over one end of counter at 20 in. height, keeps platters heated and ready for serving. A 1,000-w unit in duct running from kitchen to serving bar to keep foods warm.—L. Albertson, application engineer, Philadelphia Electric Co.

Electric Bread Baking Oven has replaced an oil installation at Silver Loaf Baking Co, Spokane, Wash. Efficiency and cleanliness has increased, product is more uniform, and man-hours have been reduced. Equipment includes an automatic unloader and a conveyor carry-away system. Bread oven is 400 kw; sweet goods oven, 25 kw; cake ovens, 64 kw; misc motors, lights and donut machine, 180 kw. Demand is 660 kw. Average rate 9.33 mills a kwhr. Cost per 100 one pound loaves at 100.22 whr per lb is 7.61¢ per 100 lb.—W. A. Newman, Washington Water Power Co.

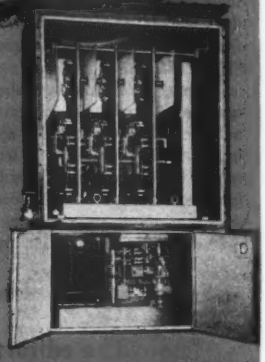
MOLONEY VOLTAGE REGULATING APPARATUS . . .
. . . THE ANSWER TO YOUR REGULATION PROBLEMS!

Moloney Step-Type Feeder Voltage Regulators, Regulating Transformers and Load Ratio Control Transformers have been chosen by many system engineers to solve their regulation problems after considering the following advantages of Moloney Load Tap Changer with which they are equipped.

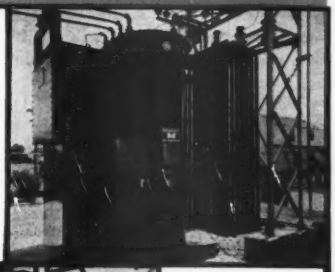
1. RELIABILITY . . . The tap selector switch is mechanically driven by Geneva gears to assure correct positioning. Arcing is prevented on this switch since the load transfer switch assumes the entire load before the selector switch contacts are opened and maintains this load till after the selector switch contacts close in the next tap position. The load transfer switch, which is the only switch required to transfer load current, is provided with accelerating springs and is driven by Geneva gears. This assures quick break of the current arc.

2. LOW MAINTENANCE COST . . . Contacts which transfer load current are accessible for inspection and maintenance through an access opening in the Load Tap Changer compartment cover. Arcing duty is imposed on only four stationary contact tips per phase as contrasted with eighteen in mechanisms performing both tap selection and load shifting duties on the same contacts.

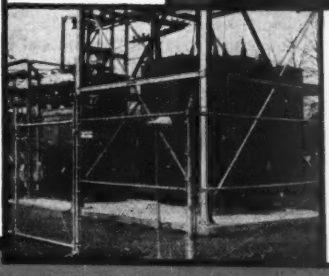
3. LOW LOSSES . . . The Moloney Load Tap Changer incorporates an ingenious method of by-passing the switching reactor to eliminate reactor copper losses. These losses are eliminated in all operating positions on 1¼% step apparatus and in half of the positions on ⅝% step apparatus.



Moloney three-phase Load Tap Changer with automatic controls. Tap assembly contains Tap Selector Switch, Load Transfer Switches and Reversing Switch. Motor drive and auxiliary equipment are at lower right. Automatic controls are at lower left. Moloney Automatic Control equipment features a super-sensitive voltage regulating relay and an electronic time delay circuit. A complete line of remote-manual and automatic controls and associated equipment is available.



Load Ratio Control Transformer rated 3000 Kva, 13200 volts Delta to 4330Y/2500 volts, equipped with automatically controlled Load Tap Changer.



Load Ratio Control Transformer rated 3000 Kva, 13500 volts Delta to 4330Y/2550. Load Tap Changer equipment provides plus or minus 10% regulation in 32-⅝% steps.

MOLONEY ELECTRIC COMPANY

Manufacturers of Power Transformers • Distribution Transformers • Load Ratio Control Transformers • Step Voltage Regulators • Unit Substations

SALES OFFICES IN ALL PRINCIPAL CITIES • FACTORIES AT ST. LOUIS, MO. AND TORONTO, ONT., CANADA

SALES AND SERVICE

RESIDENTIAL • RURAL
COMMERCIAL

Sales Executives Tell Electrical World What They Want

Today nearly 9 out of 10 electric utility sales executives want to know more about the sales plans of manufacturers of appliances and other utilization equipment. Just as many are concerned about what may happen to their departments' manpower in the days ahead. These conclusions result from a survey just completed by "Electrical World".

About 8 out of 10 sales heads questioned want more information on activities of EEI, NEMA, and other industry committees; would like to see more examples of advertising by other utilities; want to know more about service methods and practices of dealers, distributors, manufacturers and service companies; want to be better informed on price and availability trends of appliances.

Some 7 out of 10 would like to have more news about developments in the appliance manufacturing field—new factories, expansions of production facilities etc, and about the operations of electric leagues. About six don't see as many announcements of appliance models as they would like. Fewer than that care about looking at more lighting layouts.

Why We Did It . . . This seems like a heterogeneous collection of information but there was a purpose in finding out these particular things. Recently "Electrical World" stepped up the amount of editorial space allocated to commercial topics. The editors had to know what subjects its readers want. To find out they asked 112 electric utility sales executives to vote "yes" or "no" according to their interest in a list of 10 possible subjects. The ten subjects and the votes on them are detailed below.

The response was extraordinary. To date 85 opinions have come in from 112 queries. Over half of the replies were backed up by comments and suggestions in accompanying letters.

Some Representative Comments . . . "I believe that commercial articles in

The editors asked 112 utility sales executives which of these ten subjects

1. Sales plans of manufacturers, including schools, clinics and the like?

Yes, 74. No, 11. 87.1% in favor.

Manufacturers do a good job of publicizing in this field, remarks one negative reply and another says, "we are more than fully informed" on these matters. On the other side of the fence is this expression, "We are very strong for inclusion in 'World' of more news on promotional programs and activities of manufacturers and other sales allies." "Information will be very helpful," comments another reply, and a third urges, "Do whatever you can to promote sales training and indoctrination of dealers by manufacturers, to change them from order takers into salesmen."

2. Diversion of sales forces to other work as they may occur in the time ahead?

Yes, 73. No, 12. 86.1% in favor.

Information on this subject would be helpful, commented two replies. "This is probably the No. 1 problem for 1951" and, "Stress it, please, and give wide coverage on what companies are doing or contemplating," are the remarks of two others. A fifth reply said the question was academic, stating, "We did not divert sales forces to other work during World War II and have no intention of doing so in the time ahead if we have evaluated properly what is apt to occur during that time."

3. Activities of EEI, NEMA and other national industry committees?

Yes, 71. No, 14. 83.5% in favor.

All of the comments on this question were on the "no" side, saying that information was available from other sources. In one was the qualification that there might be an advantage in having "Electrical World" act as a "clearing house," one place in which could be found information on all committee activities.

4. Appliance advertising of utilities as can be given by publication of outstanding and typical examples?

Yes, 67. No, 18. 78.9% in favor.

One replier qualifies his "yes" to this question with the words, "really good ones." Several of the "no" answers pointed out that examples of advertising are already available to them from Reddy Kilowatt service and the Public Utilities Advertising Association.

5. Service methods and practices of others than utilities—dealers, distributors, manufacturers and service companies?

Yes, 67. No, 18. 78.9% in favor.

Negative comments on this question instanced in two replies the availability of such information in other publications and another was to the effect that the problem was generally a local one, requiring solution in local conditions.

On the "yes" side were five comments, some quite emphatic. From one, "dealers in automatic laundry equipment have to a large extent not been capable of adequate servicing";

'Electrical World' should stress creative jobs that are being done by many utilities in building up their communities—promotion of industrial and other development beyond the usual scope of utility operations and sales practices. Utility sales organizations should raise their sights to what they can do in building their communities because by so doing they can build their companies, and themselves."

"How about giving more space . . . to indirect sales activities? I refer to 'Rural and Urban Development' programs. Price and service are not enough to compete against the trend towards socializing our industry. We must be community planners and leaders. . . ."

"My idea of 'Electrical World' has always been that it is pretty much of an engineering magazine. Certainly if you decide to include information on the subjects listed, the magazine would become much more interesting to me."

"While I can easily sympathize with your desire to do all possible to improve the value of your publication, I cannot help but feel that what you propose would be duplication of what is already covered by other industry publications. For my part I think of 'Electrical World' more as a technical publication well serving its particular field. . . ."

Other Views of Duplication . . . "I think your objective in broadening the scope of 'Electrical World' has considerable merit. We would be interested in articles covering practically every subject listed. Much of this information is now available in different publications but to have it from one source would be very valuable."

"My feeling is that some of the subjects you suggest are covered in detail in other industry publications. It seems to me that 'Electrical World' would perform a useful service if it would summarize these subjects to give rather complete coverage in one place. Other subjects you list are important and are not being covered in detail in other publications. It would be helpful If you could do a thorough reporting job on these."

"All of the subjects you suggest including or expanding in 'Electrical World' are adequately covered by other magazines specializing in the particular fields. Most or all of these are carefully read by the responsible sales personnel in our company, but not by our engineers and top executives. But 'Electrical World' is read by them. It would be very helpful to us if you at least summarized the listed subjects so as to give these engineers and executives some up-to-date knowledge of happenings in the commercial field. In other words, expanding the commercial content of 'Electrical World' would not help me much in my work, but would be distinct benefit to me in the handling of my job by keeping the engineering and executive men informed of commercial activities."

"There is need to educate operating and engineering personnel on the fact that kwhr increase only when additional appliances and other equipment are plugged or wired in."

they would like "Electrical World" to cover regularly. Here are their answers!

"important" said another. Another reply asked for service practices of utilities, particularly with respect to policies on water heaters and residential and commercial cooking equipment.

6. The appliance market — price trends, availability of goods, etc?

Yes, 65. No, 20. 76.5% in favor.

Comments on this question were evenly divided, three in "no" replies and three in "yes." One of the "no's" said that the manufacturers were quick with this information and another that it was all bad news anyway, prices up and supply down.

The "yes" comments were emphatic with underlinings of the word. One remarked rather bitterly about dealers in small towns not getting appliances when those in big cities had them running out of their ears.

7. Operations of electric leagues?

Yes, 58. No, 27. 68.2% in favor.

Only one comment was offered on this question. It was that published information on league activities might be of considerable value to sales executives in whose territories there were no such organizations.

8. Developments in the appliance manufacturing field such as new factories, expansion of production facilities, etc?

Yes, 57. No, 28. 67.1% in favor.

Adequate coverage by other publications is the reason given for "No" in two replies. Another two say that manufacturers' representatives keep the repliers well informed on such developments.

9. New models of appliances as announced by manufacturers?

Yes, 52. No, 33. 61.2% in favor.

Of the 33 "No" replies, 18 noted availability of this material in other publications, particularly Electrical Merchandising. This may be taken as the reason for the other negatives. One "yes" reply was qualified:

"It would be interesting to see announcements of new models that incorporate real innovations and of appliances or devices that are entirely new. Too much space in other publications is now devoted to nothing more than face-lifting jobs on old appliances."

Another "yes" reply remarked that publication of new model announcements would be worthwhile if it were done very briefly because much of such published material is "too voluminous for many of us to wade through." "Should not take up too much space at the expense of other material" is the comment of a third.

10. Layouts of lighting installations?

Yes, 46. No, 39. 54.1% in favor.

Most of the comments accompanying the "no" replies on this question said that "Electrical World" would only be duplicating material in other publications. One reply said pictures but not layouts because a good lighting man can get the ideas from them.

UNIVERSAL means

...WITH A NEW ELECTRIC RANGE

The Sensational *Select-a-Range*

More than 25 variations from 3 basic units . . . a model to fit every purse and every kitchen!

"Convenience-Level" oven at the height you select banishes stooping and bending forever!

"Divided" and Built-in arrangements provide modern cooking convenience to fit your kitchen!

Most publicized . . . most talked-about Electric Range in America!

The New 1951 *Speedliner*

New eye appeal and irresistible beauty!

Famous Thermo-Chef auxiliary range—top oven!

Extra-large Tru-Bake Oven with "Push-Button" Pre-Heat that's as much as 40% faster!

Extra fast 7-heat Manotube Thrift Units!

America's Fastest, most Efficient Electric Range!

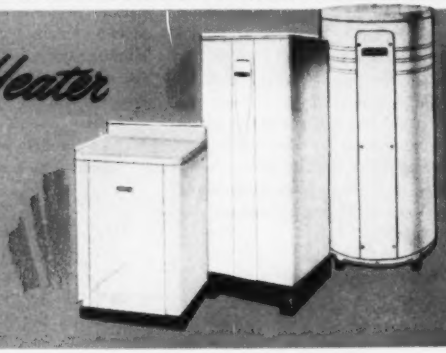
The Incomparable *Water Heater*

Exclusive Temp-O-Stat limit switch. Extra-safe!

Magnesium Rod to retard rust. No "red" water!

Super-Heat Immersion Units applies all the heat to the water for faster heating!

The World's Safest Electric Water Heater!



BUSINESS in '51!

AND WATER HEATER PROGRAM

WINNER of National Awards including the coveted Society of Motion Picture Art Directors Award for the most advanced concept of design and beauty! Electrical Manufacturing Magazine Award for outstanding achievement in development, design and engineering! Plus many other citations from national magazines and shows!

A great promotion that sells *In your Town On your Street In your Store*

YOUR SHARE of the more than 40,000,000 selling contacts made on your customers in Universal's great national advertising program in Saturday Evening Post, Look, Woman's Home Companion and many other leading magazines!

YOUR SHARE of a power-packed, product-selling cooperative local newspaper program to direct customers right to the sales floor of your store!

UNIVERSAL is going places in 1951! Don't miss the chance to build volume with the industry's biggest leading range and water heater line. Call your Universal Distributor today . . . he has news you'll want to hear!

Quality and Value Since 1842

UNIVERSAL

LANDERS, FRARY & CLARK, NEW BRITAIN, CONN.

NEW EQUIPMENT

Earth Boring Equipment

Performance of new hole-digging equipment, using augers four and five feet in diameter, is claimed to approximate that of heretofore-manufactured machines operating with 24-in. diam augers. With auxiliaries, the equipment is said to be capable of handling even transmission line multiple structures of 90 ft or more.

Earth-boring equipment is available, which may be mounted on turntables powered from the rig engine, that enables the operator to rotate the unit completely around the rear of the truck. At any point within this travel, the unit can be extended and retracted horizontally over a distance of about two feet.

Another device, called the "wiggle-tail", is powered off the truck engine. It permits the operator to rotate the unit across the rear of the truck four feet either side of center, and to extend and retract it horizontally at any point within this travel.

These machines are capable of drilling vertical holes without regard to the truck's position. A separate engine normally comes with this equipment. But units may be mounted on crawler type tractors of suitable size, operating from the power take-off of the tractor. Williams Mfg Co of Dallas builds the machines.

Joslyn Southwest Co, Pearl & Corinth Sts, Dallas, Tex.

Wire-Annealing Spider

Construction of a new type annealing spider is reported to effect an equal distribution of heating and cooling forces to prevent warping during the annealing process. It is also meant ot give longer life and reduce loading and stripping friction in wire annealing.

A large central pipe, with eight smaller pipes welded to its perimeter, holds the wire coils round with only a line contact, manufacturer reports. With an over-all height of 81 in., any diameter can be furnished within a range of 10 to 30 in. It is available with either solid or removable bottom plates to suit any stripping method.

KIF Industrial Fabricators, North Haven, Conn.

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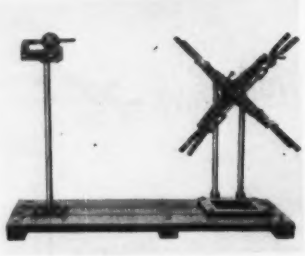


Measuring Machine

A new measuring and coiling machine is available for measuring and coiling wire, wire rope, and cordage. The coiling reel will collapse to allow coils to be lifted off; a brake prevents backlash. Because the wheel of the measuring meter rides the material, errors due to bends and twists in the wire are prevented.

Neal Co, 318 N. 18th St, Omaha, Neb.

•

Reclosing Relay

Reclosing relay, type ACR, is designed for use on automatic reclosing equipments with all types of power circuit breakers. The completely automatic reclosing equipments protect

feeders against unnecessary outages, due to temporary faults, by automatically restoring service.

Features of the relay, not available in previous designs, are:

1. Optional automatic reset at a definite time after any successful reclosure attempt;

2. A self-contained means for permitting instantaneous initial and time-delay subsequent breaker tripping;

3. Faster immediate reclosure.

The ACR relay may be adjusted for one, two, or three delayed reclosures in addition to the immediate reclosure. The delayed reclosures occur at 15-sec minimum intervals. By adjusting the cams, longer intervals can be obtained. Or the definite-time reset after immediate reclosure attempts can be omitted, in which case delayed-reclosure intervals as short as five seconds can be obtained. Relay connections can be changed to omit the immediate initial reclosure. Details may be found in Bulletin GEA-5593.

General Electric Co, Apparatus Dept, Schenectady 5, N. Y.

•

Coating Resins

Expected uses for new silicone-alkyd resins, designated Plaskon ST-856, ST-873, and ST-881, include coatings for transformers, motors, space heaters, and transmission towers. Its properties reportedly include resistance to heat, weathering, humidity, chemicals, and salt spray. Gloss and color of the first two types mentioned

7 ADVANTAGES
all in one bracket
No. 23104
1. Graceful simplicity—light weight—low cost.
2. Optional attachment to wood poles with 3 lag screws or crossarm bolt and lag screws.
3. Meets all current strength and design requirements.
4. Design permits maximum elevation of luminaire, threaded or slip-fitter style.
5. "Free-flowing" internal wiring —beveled pipe ends—no sharp bends—no obstructions.
6. Famous Hubbard Key-Hole feature . . . one man installation.
7. One piece construction throughout—permanently aligned at factory.
HUBBARD
new LAG SCREW ATTACHMENT FOR WOOD POLES

HUBBARD UPSWEEP LIGHTING BRACKETS

HOT GALVANIZED

This popular member of the Hubbard Upsweep Bracket family meets a real need where wood poles are used and short brackets are adequate. Installation is easily made by one man. A ⅝-inch lag screw is turned into the pole, leaving about one-inch projection under the head. The famous Hubbard Key-Hole feature is incorporated in the upper mounting plate, which is welded to the bracket. The Key-Hole slot is dropped over the projecting lag just back of the head.

Final tightening of the ⅝-inch lag screw is accomplished with a wrench, working clearance for which is provided by the bracket's special design. The two bottom ½-inch lags are inserted, and the attachment is complete and secure. At the user's option greater strength may be obtained by substituting a ⅝-inch crossarm bolt for the ⅝-inch lag screw.

The above bracket is also currently available in Aluminum Alloy. Write for complete details.

HUBBARD AND COMPANY

ESTABLISHED 1843

PITTSBURGH • CHICAGO • OAKLAND, CALIFORNIA

"Hang the Load on Hubbard Hardware!"

Penta* protects poles, cross-arms and other wood construction

PENTA-PROTECTED wood effectively resists termites and decay, lasts up to *four times longer* than untreated wood. PENTA leaves wood clean, easy to work with and handle.

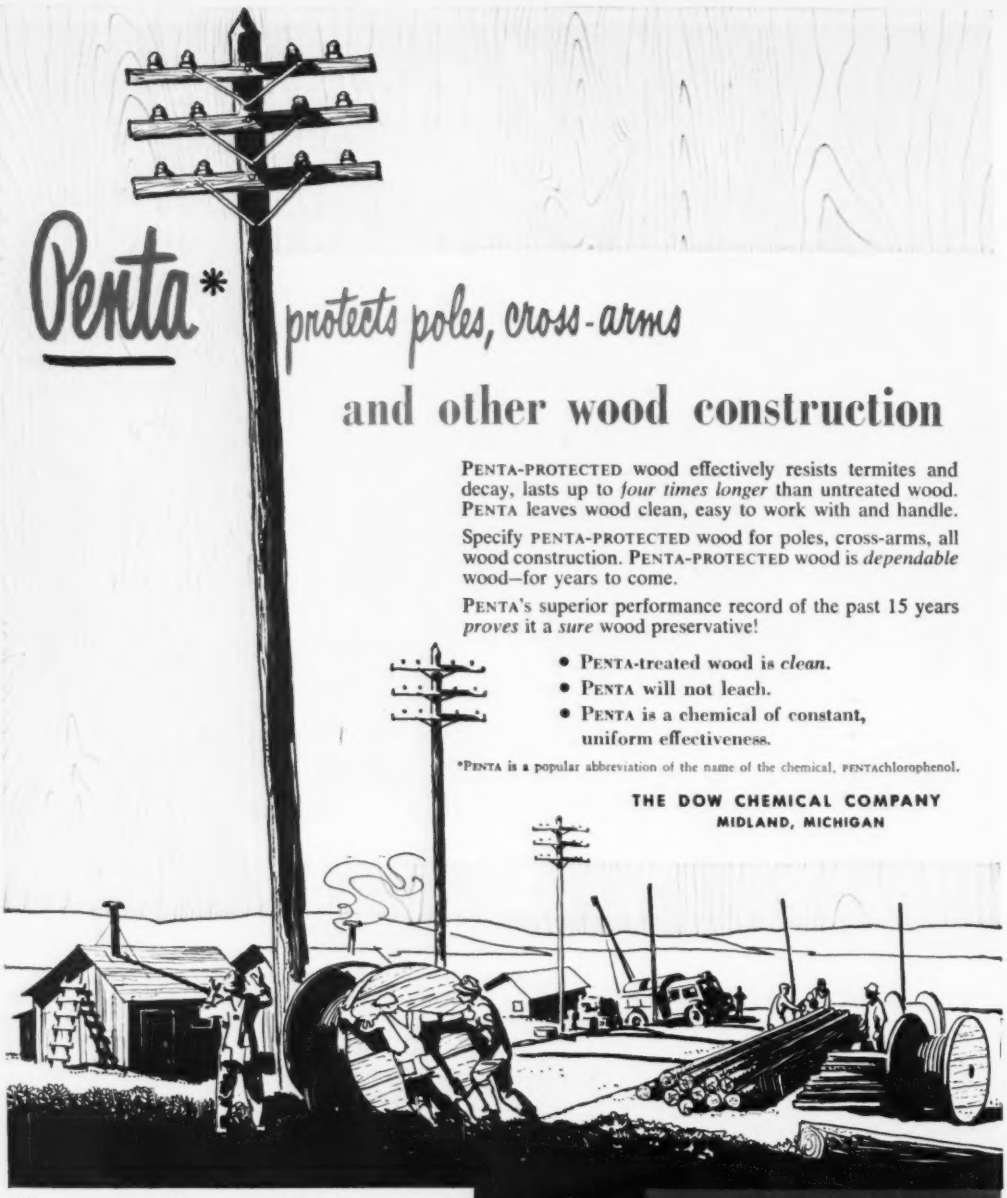
Specify PENTA-PROTECTED wood for poles, cross-arms, all wood construction. PENTA-PROTECTED wood is *dependable* wood—for years to come.

PENTA's superior performance record of the past 15 years *proves* it a *sure* wood preservative!

- PENTA-treated wood is *clean.*
- PENTA will not leach.
- PENTA is a chemical of constant, uniform effectiveness.

*PENTA is a popular abbreviation of the name of the chemical, PENTAchlorophenol.

THE DOW CHEMICAL COMPANY
MIDLAND, MICHIGAN



Write *for Dow's free booklet, "Pointers on Penta"*

The Dow Chemical Company
Dept. PE-20
Midland, Michigan

Name _____ Title _____

Company _____

Address _____

City _____ State _____

DOW
Penta
chlorophenol

are maintained in the range 400-500 F. The ST-881 resin for aluminum finishes maintains film properties beyond 1,500 F.

Manufacturer expects that the price range of the silicone alkyd resins will eventually approach the price range of regular alkyd resins.

Libbey-Owens-Ford Glass Co, Plaskon Div, Toledo, Ohio.

•

Induction-Heat Brazer

A quick production set-up has been added to the manufacturer's induction heater line for brazing, soft soldering, or heat treating a wide range of moderate-size parts. The heating coil is located just below the work piece for the particular set-up shown. Heating coils bolt to the front of the machine and can be changed in about 30 sec.

Operating controls are at the top-front of the machine. With an output frequency in the megacycle range, the machine is designed for both steel and brass work. It is supplied from 220-v, 60-cycle, single-phase lines.

Sherman Industrial Electronics Co, Belleville, N. J.

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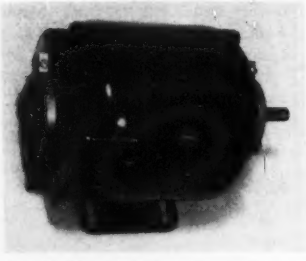


Attic-Fan Motor

Vertically or horizontally-operated belt-driven attic fans can be powered by two new motor types. Bearing construction is designed to carry thrust

CRESCENT
ENDURITE
DUAL PURPOSE WIRE & CABLE

Listed by Underwriters' Laboratories as
TYPE RH-75° C
OR
TYPE RW-60° C

Makes Your Dollars Go Further

In DRY locations ENDURITE insulated wire and cable with its superior heat-resisting characteristics, is rated as a Type RH with higher permissible operating temperature and consequently greater carrying capacity.

In WET locations this same wire with its excellent moisture-resisting qualities is rated as a Type RW.

Except where voltage drop is the determining factor, CRESCENT ENDURITE when used as a Type RH allows the use of a smaller size of cable and in many cases smaller size of conduit at less cost than would be required for Type R or Types T or TW for the same load.

Usually in sizes No. 6 A.W.G. and heavier for power circuits and No. 1 A.W.G. and heavier for lighting circuits CRESCENT ENDURITE as TYPE RH will give the lowest cost per ampere of useful circuit capacity.

For branch circuits requiring small size conductors, Voltage Drop is the determining factor in the choice of conductor size.

There is also a definite advantage to you in the REDUCTION OF STOCKS as this one wire will meet all your building wire requirements for both the usual dry location and the occasional wet location.

It makes the most efficient use of critical materials

Send for Bulletin giving Comparative Current-Carrying Information

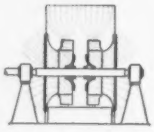
CRESCENT
WIRE & CABLE

CRESCENT INSULATED WIRE & CABLE CO.
TRENTON, N. J.

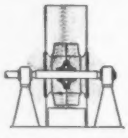
ANOTHER pd DEVELOPMENT

Gives you GREATER CONVERSION

OF VELOCITY PRESSURE TO STATIC PRESSURE



How P-D split wheel assists diffusion—aids distribution throughout the fan.

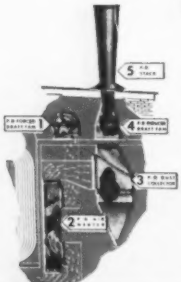


Conventional double wheel with common disc produces concentration, results in poor diffusion.

Performance ratings of the Prat-Daniel F-D Fan are established according to the Standard Test Codes adopted by N.A.F.M. and the A.S.H.V.E.

Design characteristics provide unusually high conversion of Velocity Pressure to Static Pressure. This is accomplished by streamlined inlet cones that are larger in proportion to the wheel than are usually found in forced draft fans. The unusual depth of the cones provide a wider housing than would customarily be used, increasing the space available for diffusion. Precisely fashioned backward curved blades provide a nearly perfect aerodynamic flow across both leading and trailing edges. Double wheel fans are spaced apart to permit four way diffusion of air, further contributing to this conversion. Peak efficiency and horsepower curves fall well within normal fan selection range, offering the optimum in maximum efficiency and non-overloading characteristics.

These are all carefully researched features that have made the Prat-Daniel F-D Fan a highly efficient apparatus. Check these features before you decide on your next fan. Write for catalog No. 300 today.



UNIT RESPONSIBILITY

The Thermix Corp., project engineers for the Prat-Daniel Corp., offer all components required for the handling of air and gas: (1) P-D Forced Draft Fans; (2) P-D Air Pre-Heaters; (3) P-D Tubular Dust Collectors; (4) P-D Induced Draft Fans; and (5) P-D Fan Stacks. This unit responsibility, by a well known firm, relieves the engineer of the necessity of integrating equipment from various sources into the over-all project.

Sales and Project Engineers

THE THERMIX CORPORATION

GREENWICH, CONN.

Canadian Affiliates: T. C. CHOWN, LTD.
1440 St. Catherine St. W., Montreal 25, Quebec
50 Abell St., Toronto 3, Ontario

Designers and Manufacturers

PRAT-DANIEL CORPORATION

SOUTH NORWALK, CONN.

loads caused by the weight of rotor and pulley. Vertical operation of the motor with the shaft extension up or down is permissible.

It is available as a split-phase, 115-v, ¼ or 1/3-hp Type FHT motor, or as a capacitor-start, 115/230-v, ½-hp, Type FJ motor. Temperature rating of Type FHT is 50 C continuous; Type FJ is 40 C continuous. Both types are externally reversible.

Westinghouse Electric Corp, P. O. Box 2099, Pittsburgh 30, Pa.

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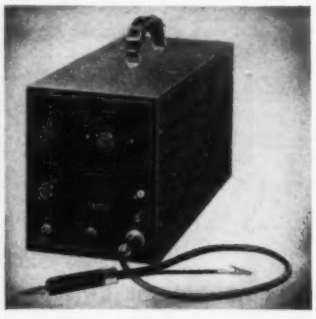


Wave Form Investigator

A video amplifier has been designed for complex wave form inspection in connection with an oscilloscope. A gain control permits adjusting the output from 0 to 50 v rms. A signal polarity switch on the front panel varies the cathode bias so that the amplifier unit may be adjusted for optimum performance regardless of polarity of the input signal. Phase shift is minimized to give satisfactory reproduction of pulses on the order of one microsecond and square waves at repetition rates as low as 100 per second.

The gain is 1,000, while the frequency response is flat from 15 cps to 4 mc within 1.5 db of the 10-kc response point. Input impedance, without probe, is about 2.2 megohms and 40 μμf on all attentuator ranges.

Ripley Co, Inc, Middletown, Conn.

•

Resistance Thermometer

Average temperature of oil, petroleum, chemicals, and other liquids in land storage tanks is said to be given by Model 918 resistance thermometer. It can be installed in existing tanks without taking the tank out of service.

A reading accurate to within 0.5 deg F is reportedly obtained in a few

WHY VICTOR PINTYPES KEEP DISTRIBUTION COSTS DOWN

RUGGED, THICK CROSS SECTION gives maximum strength and resistance to impact.

LARGE RADIUS TOP AND SIDE WIRE GROOVES make hot-tieing easy and quick.

SMOOTH CONTOUR *plus* smooth, hard glaze give unsurpassed self-cleaning characteristics—ideal for contaminated areas.

MAXIMUM LEAKAGE DISTANCE conserves current, helps maintain rated voltage, and minimizes outages.

EACH VICTOR LOW-VOLTAGE PINTYPE is individually inspected at every point of manufacture.

HIGHEST QUALITY WET PROCESS PORCELAIN provides highest dielectric and physical strength.

VICTOR NO. 5 LOW-VOLTAGE PINTYPE. For complete engineering data on this insulator and other sizes and types, write today for Bulletin No. 4.

These are only a few of the reasons why VICTOR Low Voltage Pintype Insulators are famous for performance *and* economy. They last longer—give *extra* years of service—cut line maintenance costs to a minimum. Power men everywhere prefer VICTOR Pintypes!

Do You Know that...

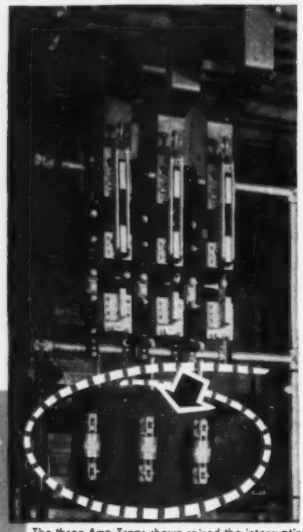
The first wet process porcelain insulators were produced at Victor in 1893. In fact, many of our skilled craftsmen have been making high quality porcelain insulators at Victor for over 40 years.

Specify

VICTOR PINTYPE INSULATORS

VICTOR INSULATORS, INC. VICTOR, N. Y.

how to trap amperes and save circuits....



The three Amp-Traps shown raised the interrupting capacity of this 1600 amp circuit to 100,000 rms amperes @ 440 volts.

SHAWMUT Amp-trap®

AMAZING NEW CURRENT LIMITER

100,000 rms AMPERES INTERRUPTING CAPACITY

TWO-WAY PROTECTION

Amp-trap protects against *both* overloads and shorts on circuits up to 600V AC or DC. It is supplied in all standard ratings from 1 to 4,000 amps; and limits short circuit current on circuits where the available short circuit current may be as high as 200,000 amps.

STOPS SHORT CIRCUITS SHORT

Amp-trap puts a dependable new protective device in the hands of designers, engineers and architects. Lightning fast, it is directly responsive to the *rate of short circuit current rise*. In fact, *it is as fast as the circuit is fast*. This means positive overload and short circuit protection for switchgear, bussducts, motor starters, circuit breakers, and current transformers. What's more, with Amp-trap, you can now have low-cost protection for every service entrance on a network system.

APPROVALS

Amp-trap is listed by Underwriters Laboratories. Interrupting tests up to 202,000 amps at 500 Volts 60 cycles have been witnessed and certified by Electrical Testing Laboratories, Inc.

FOR OLD OR NEW SYSTEMS

There is an Amp-trap for every application. They are easily installed and quickly adapted to new or old equipment. Cost is so low that it is not an important factor.

WRITE TODAY. SEND FOR FREE BOOKLET ON AMP-TRAP.

*Trade Mark Registered.

(You can get Amp-trap)

THE CHASE-SHAWMUT CO.

370 MERRIMAC STREET • NEWBURYPORT, MASSACHUSETTS

seconds. Since temperature is a determining factor in measuring volume, shipping and billing data can be accurately calculated by use of the new thermometer.

It is comprised of a flexible resistance bulb assembly, a meter, and an oil level selector. Meter and selector are enclosed in a meter housing while the bulb assembly is placed permanently inside the tank. It can be furnished in any scale with a total span of not less than 100 deg F. Operation is from 6-v dry cells or a 115-v ac circuit equipped with transformer and rectifier.

Weston Electrical Instrument Corp, 641 Frelinghuysen Ave, Newark 5, N. J.

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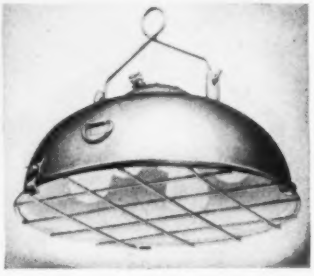


General Duty Lamp

Wherever a wide distribution of light is needed, the General Duty-Lite 16½-in. reflector may be used. Typical applications are for construction, storage, and cargo lighting. Two models are available: A cluster of four, and a cluster of five medium-base sockets.

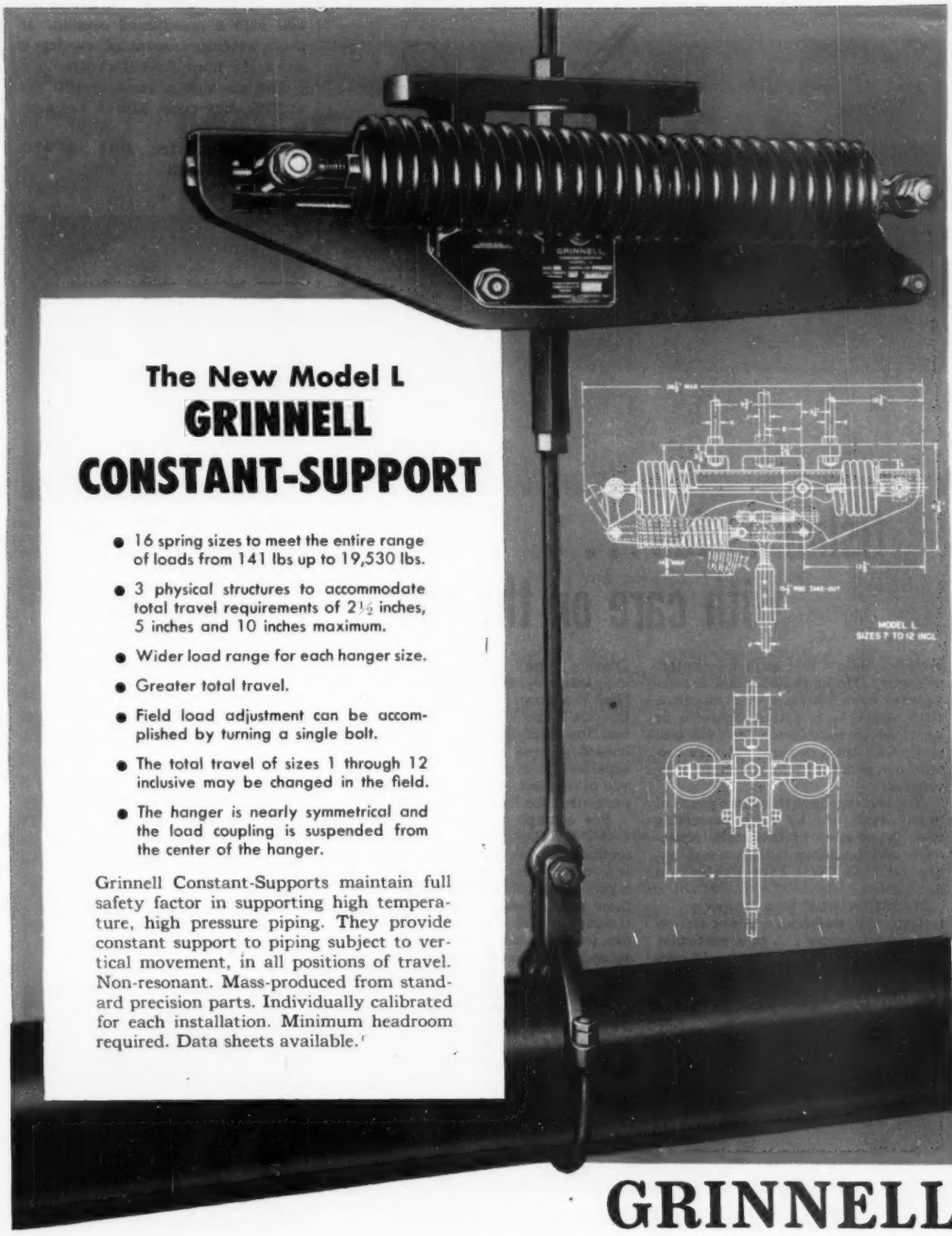
Removable cover-plate at the top of the unit eliminates time-consuming wiring from the front. A support loop allows the light to be slid from place to place on cord or cable.

S & M Lamp Co, 119 W. 36th Pl, Los Angeles 7, Cal.

•

Mash Welder

Press-type mash welding machine, Type PMM2TL, has been designed for joining a 28-in. width of mild steel sheet to form a continuous line for various mill operations. In operation, the worker inserts the ends of the sheet to be welded to a stop between the electromagnetic clamping bars and depresses a control button. This clamps the sheets in place and moves the parts to the welding posi-



The New Model L
GRINNELL
CONSTANT-SUPPORT

- 16 spring sizes to meet the entire range of loads from 141 lbs up to 19,530 lbs.
- 3 physical structures to accommodate total travel requirements of 2½ inches, 5 inches and 10 inches maximum.
- Wider load range for each hanger size.
- Greater total travel.
- Field load adjustment can be accomplished by turning a single bolt.
- The total travel of sizes 1 through 12 inclusive may be changed in the field.
- The hanger is nearly symmetrical and the load coupling is suspended from the center of the hanger.

Grinnell Constant-Supports maintain full safety factor in supporting high temperature, high pressure piping. They provide constant support to piping subject to vertical movement, in all positions of travel. Non-resonant. Mass-produced from standard precision parts. Individually calibrated for each installation. Minimum headroom required. Data sheets available.

GRINNELL
WHENEVER PIPING IS INVOLVED

GRINNELL COMPANY, INC., Providence, R. I. Warehouses: Atlanta • Billings • Buffalo • Charlotte • Chicago
Cleveland • Cranston • Fresno • Kansas City • Houston • Long Beach • Los Angeles • Milwaukee • Minneapolis • New York
Oakland • Philadelphia • Pocatello • Sacramento • St. Louis • St. Paul • San Francisco • Seattle • Spokane

fishin' is fun . . .
with care on the run

Here's a fellow that enjoys complete relaxation. He knows his plant is safeguarded from fire . . . a short circuit, a stray spark, a forgotten cigarette or spontaneous combustion can't cut into production time, destroy valuable records or endanger the lives of employees.

You too, can have this same peace of mind about fire by fully protecting your investment in materials, equipment and buildings with modern, approved C-O-TWO Fire Protection Equipment.

No matter what your property . . . factory, mill, warehouse, power station or research center . . . or a particular fire hazard such as spray booth, dip tank, pump room, electrical equipment enclosure or record vault . . . there is a type of C-O-TWO Fire Protection Equipment that gives you fast, positive action the instant fire strikes. Whether it's a C-O-TWO Squeez-Grip Carbon Dioxide Type Fire Extinguisher for an incipient fire, or a C-O-TWO Built-In High Pressure or Low Pressure Carbon Dioxide Type Fire Extinguishing System for total flooding an entire fire hazardous area . . . C-O-TWO means experienced engineering that assures you of the best type equipment for the particular fire hazard concerned.

For example, at many locations a C-O-TWO Combination Smoke Detecting and Fire Extinguishing System is a "must". The first trace of smoke in a protected area sounds an alarm . . . then fast, clean, non-damaging, nonconducting carbon dioxide blankets the fire, putting it out in seconds, before it spreads and causes extensive damage.

So, let an expert C-O-TWO Fire Protection Engineer help you in planning complete and up-to-date fire protection facilities now. Write us today for complete free information . . . our experience is at your disposal.

C-O-TWO

C-O-TWO FIRE EQUIPMENT COMPANY

NEWARK 1 • NEW JERSEY

Sales and Service in the Principal Cities of United States and Canada

Affiliated with Pyrene Manufacturing Company

MANUFACTURERS OF APPROVED FIRE PROTECTION EQUIPMENT

Squeez-Grip Carbon Dioxide Type Fire Extinguishers • Dry Chemical Type Fire Extinguishers
Built-In High Pressure and Low Pressure Carbon Dioxide Type Fire Extinguishing Systems
Built-In Smoke and Heat Fire Detecting Systems

tion with a preadjusted overlap. In mash welding, amount of overlap is about 1½ times sheet thickness.

The machine is rated at 150 kva at 50% duty cycle, 220 or 440 v, 3-phase, 60 cycles.

Sciaky Bros, Inc, 4915 W. 67th St, Chicago 38, Ill.

•

INCANDESCENT UNIT — "Over the bed" unit provides indirect illumination for general room lighting from 150-w lamp, and direct illumination from a 75-w lamp for use as a reading light.

Curtis Lighting, Inc, Dept N-17, 6135 W. 65th St, Chicago 38, Ill.

•

Male Thread Bushing

Feature of a new male thread insulating bushing is the ribbed outer surface which facilitates installation by providing a sure grip. Ribs may also be used as a driving point for tapping bushing with a screwdriver. Smooth, rounded edges protect wire insulation during pulling and when in service. It may be used in conjunction with either a lock nut or O.Z. Type A insulating bushing.

O. Z. Electrical Mfg Co, 262 Bond St, Brooklyn, N. Y.

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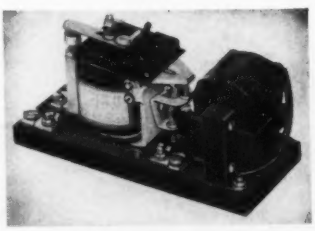


Voltage-Sensitive Relays

An addition to the company's line of magnetic relays is the Bulletin 401 voltage-sensitive relay for use in ac circuits where a close voltage differential between relay pick-up and drop-out is needed. A typical appli-

MORE AMPERES CAN RIDE THESE CABLES

You can do yourself and our country a service by installing Simplex-ANHYDREX XX Cables wherever you need to replace high voltage power cable.

Here's why. You can crowd more amps into the same size copper when it is insulated with Simplex-ANHYDREX XX. That's how you save copper. Of course your cables will run hotter but that's all right with Simplex-ANHYDREX XX insulation. This insulation is built to withstand 75°C. to 80°C. (167°F. to 176°F.), depending on operating conditions.

Simplex-ANHYDREX XX Insulated Cables can be used underground, directly in the earth, or in ducts, or they can be used overhead as aerial cables. The special Simplex neoprene jacket protects these insulated conductors from sunlight, oil, acids, alkalies, etc.

Want to know more about this versatile high temperature, high voltage power cable insulation that really combats moisture and water? Then return the coupon. No obligation, of course.

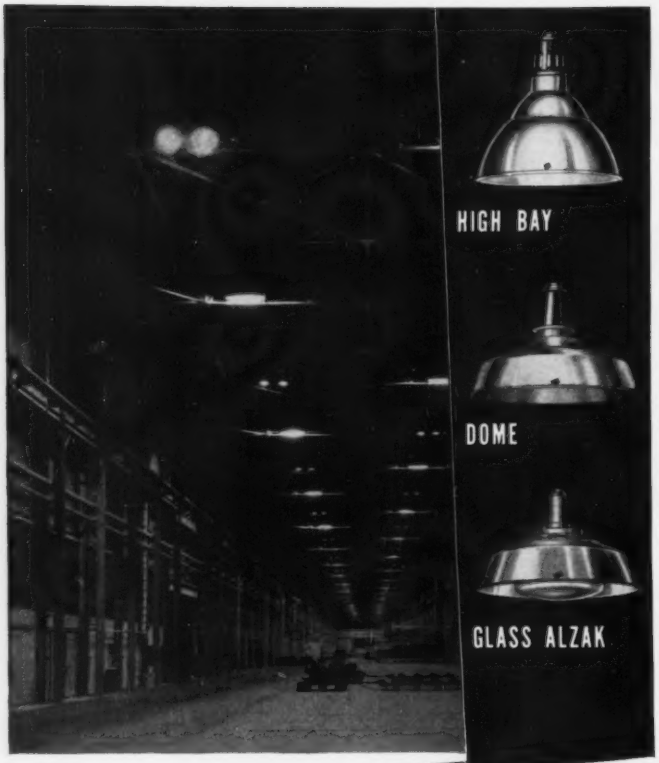
Simplex-ANHYDREX XX is a product of Simplex Research

SIMPLEX WIRES & CABLES

SIMPLEX WIRE & CABLE CO.
79 Sidney St., Cambridge 39, Mass.

SIMPLEX WIRE & CABLE CO.
79 SIDNEY ST., CAMBRIDGE 39, MASS.
GENTLEMEN: PLEASE SEND A COPY OF BOOKLET 1009A TO:

NAME _____ TITLE _____
COMPANY _____
STREET _____
CITY _____ STATE _____



FOR FACTORY USE and ABUSE

GUTH AAA INDUSTRIAL REFLECTORS

made of ALZAK Aluminum, the *permanent* surface that, properly cleaned, maintains initial high efficiency.

RESISTS ▸ heat and abrasion, acid fumes, salt spray, smoke and soot

WILL NOT ▸ chip, break, peel, rust, corrode, tarnish, check

Even dropping the reflector will not damage ALZAK finish; small dents can easily be straightened out.

As the first step toward better light that *stays bright*, learn the complete details from our Catalog 890-H. It's yours for the asking.

Guth LIGHTING

THE EDWIN F. GUTH COMPANY / ST. LOUIS 3, MISSOURI

Leaders in Lighting Since 1902

cation is protecting ac motors up to 2 hp against damage caused by low line voltages. Other important uses include power and lighting bus transfer, and, in some cases, over-voltage protection.

The relay consists essentially of an insulating base on which are mounted a power-type Bulletin 103 or 130 ac magnetic relay, with S.P.N.O. contacts and a small saturable reactor. Relay coil and reactor are series-connected. Because the reactor imparts non-linear characteristics to the relay circuit, slight voltage changes across the series combination result in wide current variations required for close differential operation.

Nominal coil voltages for heavy duty types are 115, 230, and 440 v, 60 cycles; for light duty types, 115 and 230 v. Relays with 115-v coils pick-up at 105 v and drop-out at 95 v.

Ward Leonard Electric Co, Mount Vernon, N. Y.

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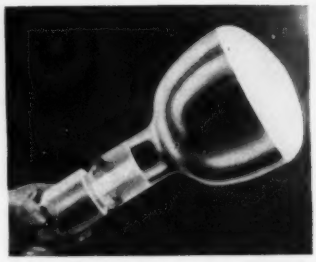


High-Bay Industrial Lamps

Almost no dirt is claimed to collect on the bottom of bulbs used with two new high-wattage industrial lamps with built-in reflectors. Produced in both 500 and 750-w sizes, the lamps employ a new bulb design, the R-52, having a special contour to distribute the light downward.

The lamps measure 6.5 in. across the face and 11¾ in. in length. They are designed to be burned base-up, or within 25 deg of that position. Downward candlepower within an 80 deg cone averages 4,000 for the 500-w lamp and 6,000 for the 750-w size.

General Electric Co, Lamp Dept, Nela Park, Cleveland 12, Ohio

•

Liquid Level Detector

Precise and sensitive control of liquid levels is reported by the manufacturer for its displacement type detector and transmitter utilizing a bel-

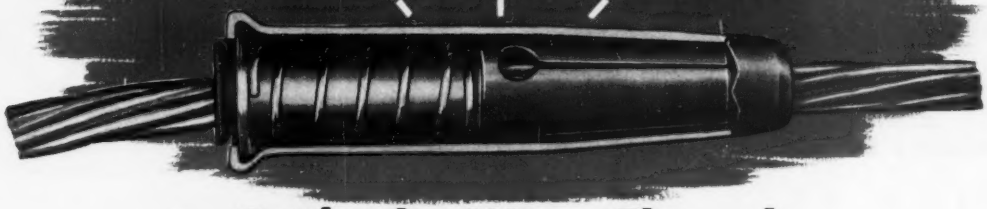
FARGO DEAD ENDS

CL27X SERIES

CL69X SERIES

260780X SERIES

are Built with a Smooth INTERNAL SLEEVE



to Guide the Wires Through
— *Making Installations Fast and Easy!*

Above, you see a cutaway view of the Fargo "one-piece" jaw, combined with the Fargo internal sleeve, that makes for the fast . . . easy installation of Fargo Dead Ends (Sizes 8 through 4/0). The precision machined, "one-piece" jaw assures perfect alignment of jaw segments to provide a positive grip on the wires; the internal sleeve guides the wires through *smoothly* to prevent strands from getting caught — and to make the Lineman's job easier . . . safer. Your Line Material Sales Engineer will be glad to give you the complete story about this outstanding feature, as well as the other advanced engineering ideas, that make Fargo quality-built Dead Ends better.

FARGO CONNECTORS

Fargo Connectors are built like a vise . . . grip like a vise — so they hold wires *permanently*. They make a vibration-proof contact . . . require no attention after installation—and provide an ideal, low-resistance connection at a cost no more than ordinary types.

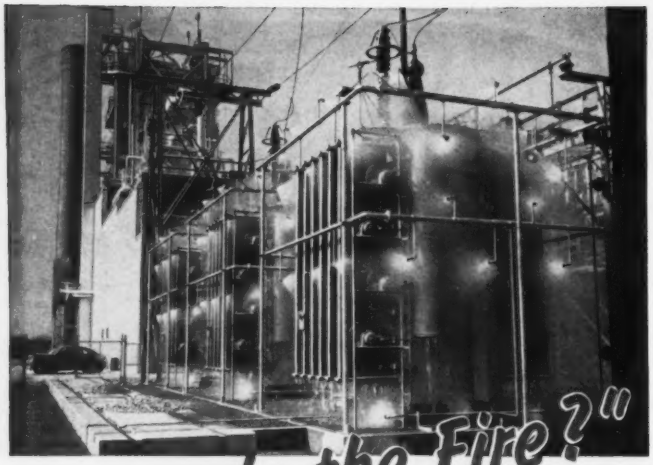
..."built like a vise —grip like a vise."

FARGO

Manufactured by
FARGO MFG. COMPANY, INC.
Poughkeepsie, N.Y.

Distributed by
LINE MATERIAL COMPANY
(A McGraw Electric Company Division)
Milwaukee, Wisconsin

LM



"Where's the Fire?"

OUT—ALMOST BEFORE IT STARTED—
THANKS TO THE SPLIT-SECOND ACTION OF A

BLAW-KNOX FOG SYSTEM

These Blaw-Knox Fire Protection Systems carry the approval of all insurance underwriters:

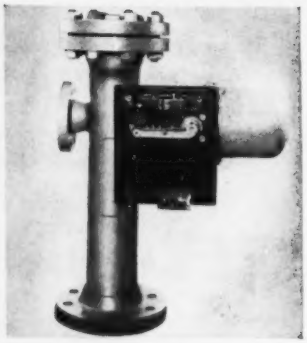
Deluge Systems, Wet Pipe Systems, Dry Pipe Systems, Water Spray and Fog Systems, Rate-of-Rise Sprinkler Systems, and Foam and Carbon Dioxide Extinguisher Systems.

The instant fire breaks out in any transformer—indoors or out—the Blaw-Knox rate-of-rise thermostat sounds the alarm and throws a dense, quenching fog of water on the danger spot. Instant application of fog extinguishes the fire and protects adjacent transformers and equipment. The remainder of the bank is back in service in short order. Blaw-Knox Fog Nozzles have no screens to clog, use raw water and maintain their effective spray pattern even at reduced pressures.

At your request a Blaw-Knox Engineer will make a survey of your fire hazards, prepare a preliminary layout of a system that will give you the utmost in fire protection, and submit an estimate of costs—all without obligation.

BLAW-KNOX SPRINKLER DIVISION
OF BLAW-KNOX CONSTRUCTION COMPANY
829 Beaver Ave., N. S., Pittsburgh 12, Pa.
Offices in Principal Cities

BLAW-KNOX FIRE PROTECTION SYSTEMS



lows seal. It is intended for use with a standard receiving-controlling instrument and a diaphragm valve. Photograph shows transmitter unit with cover removed.

The detectors may be obtained with ranges from 0-14 in. to 0-120 in.; pressure ratings of 300 and 600 psi; specific gravity 0.3 to 2.0.

Minneapolis - Honeywell Regulator Co, Brown Industrial Div, 2953 Fourth Ave, S, Minneapolis, Minn.

MORE NEW PRODUCTS
about which you should know

Potter Instrument Co, Inc, 115 Cutter Mill Rd, Great Neck, N. J., has designed the Model 801 megacycle **frequency-time counter** that can be used as a totalizing electronic counter for counting pulses or sine waves at rates up to one million per second. Used as a tachometer, shaft revolutions can be measured without contact at an accuracy of ± 1 rpm or higher. . . . Russell & Stoll Co, Inc, 125 Barclay St, New York 7, N. Y., has available factory-sealed **tumbler switches,** one and two-pole, three and four-way, explosion-proof enclosure.

Electric Cord Co, 30 Church St, New York 7, N. Y., has an automatic emergency **exit light.** It operates as an ordinary exit light unless the power fails. In that event the exit light is said to operate automatically from power furnished by batteries within the unit. . . . Alden Products Co, 117 N. Main St, Brockton, Mass., is manufacturing the Static **Magnetic Memory** for recording and storing information in digital calculating machinery; requires no vacuum tubes.

FOR EASIER HANDLING... LONGER LIFE

IN LEAD-COVERED CABLE

specify corrosion-protection tape made with FIBERGLAS yarns

FIBERGLAS* Yarns:

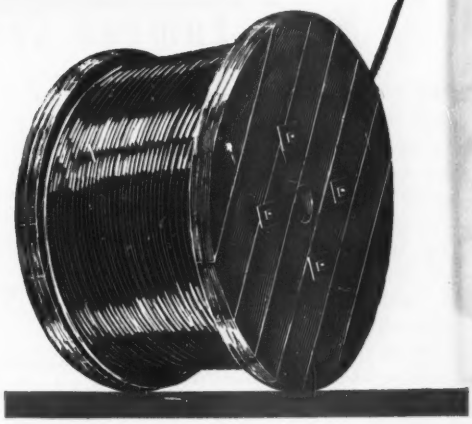
—will not absorb moisture or rot

—will not deteriorate with age

—help make possible thinner cable walls . . . lighter, easier to handle cable

—stretchproof, shrinkproof Fiberglas yarn reinforced tapes resist expansion of lead sheath

Because of increasing military requirements for Fiberglas Yarns, our customers are unable to get all they need. We are building new facilities to help meet these demands.



OWENS-CORNING
FIBERGLAS
Yarns

FIBERGLAS IS IN YOUR LIFE . . . FOR GOOD!

*Fiberglas is the trade mark (Reg. U. S. Pat. Off.) of Owens-Corning Fiberglas Corporation for a variety of products made of or with glass fibers.

OWENS-CORNING FIBERGLAS CORPORATION
Electrical Sales Division, Dept. 858
16 E. 56th Street, New York 22, N. Y.

Please send your new booklet describing wires and cables insulated with Fiberglas Yarns.

Name.....

Title.....

Company.....

Street.....

City.....*Zone*.....*State*.....

produced · treated · sold by

J. Neils Lumber Company

Much of the finest transmission and telephone pole timber in the United States grows on the 200,000 acres of forest empire owned by the J. Neils Lumber Company in Western Montana. And a large percentage of this magnificent stand is Western Larch.

The larches produce straight, tall stems, the wood of which is strong, durable. Western Larch has high bending strength, high compressive strength, unusual hardness. In shock resistance, one of the most desirable characteristics in poles, Western Larch ranks the highest of the commercial softwoods.

Possessed of the qualities of long life in their original, untreated form, J. Neils literally gives Western Larch poles *double-life* through the technical processes of a modern treating plant—thus making available transmission and telephone poles of extra durability and long service.

An illustrated folder on J. Neils treated Larch poles, and information regarding their application to your requirements, will be furnished gladly on request.

Double-Life *Western Larch Poles*

J N *J. Neils Lumber Company*

Pole Division: LIBBY, MONTANA

WHAT THEY'RE SAYING
at industry meetings

Radioisotopes Have Many Practical Uses

Gordon Dean, *chairman, U. S. Atomic Energy Commission at Northwestern University Centennial Celebration, Evanston, Ill.*

It may well be that atomic energy will make its most significant contribution to World Economy through radioactive compounds produced in nuclear reactors. Already industry has made some concrete progress with the use of radioisotopes:

1. Ford Motor Co is using radioisotopes to detect flaws in metal castings and as thickness controls in metal rolling.
2. Bell Telephone Laboratories have used radiostrontium in studying the penetration of preservatives in telephone poles.
3. B. F. Goodrich Co is trying out radiophosphorous to trace leaks in the cooling water lines of an air conditioning system and other isotopes to test various types of tire treads.
4. Standard Oil Co of California has marketed an engine oil developed with radioactive piston rings that showed the oil's lubricating qualities.
5. University of Michigan is using isotopes to test the efficiency of various laundering techniques.
6. U. S. Testing Co is using radiocobalt to compare the wearing qualities of floor wax.
7. Goodyear uses radioisotopes to measure the thickness of its Pliofilm.

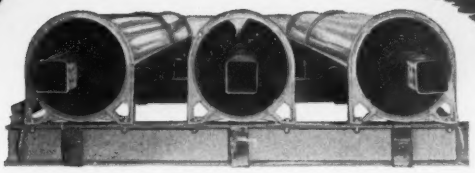
Things To Come

A. A. Johnson, *manager, Central Station Engineering, Westinghouse Electric Corp, before the Public Utility Buyer's Group, National Association of Purchasing Agents, Pittsburgh, Pa.*

In planning for the next ten years, consider these significant trends:

1. Less material will be used per unit of rating on many types of equipment . . .
2. Steam turbines will keep on as the work horses of the industry. Units of higher ratings will

REQUIREMENTS FOR A SET OF GENERATOR LEADS



ELECTRICALLY, THEY MUST

- carry the output with but one conductor per phase.
- not exceed a reasonable temperature rise.
- withstand overload without harmful effect to the conductor or its insulation.
- have a tight cover to prevent short circuiting by dust, moisture, etc., on the creepage surfaces of the insulators.
- have a minimum of bolted connections in bus run.
- protect against phase-to-phase short circuits.
- have insulation which is not harmed by heat or age.

MECHANICALLY, THEY MUST

- provide for expansion of bus and cover due to heat.
- withstand vibration.
- be adaptable to installation in congested areas.
- withstand thermal and mechanical stresses without damage or operating failure.
- employ porcelain and metals to their best advantage.

WHEN INSTALLED, THEY MUST

- present an attractive appearance.
- be easily put in place.

FOR INSPECTION AND MAINTENANCE, THEY MUST

- be easily accessible, permitting quick replacement of parts, particularly insulators.
- withstand periodic high-potential tests without damage to insulation.
- protect personnel who may come in contact with bus enclosure.

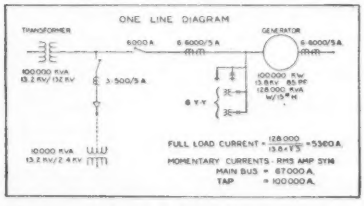
FOR ASSOCIATED EQUIPMENT, THEY MUST

- make provision for mounting disconnecting switches, instrument transformers, and protective devices.

I-T-E ISOLATED PHASE BUS MEETS ALL THESE REQUIREMENTS!

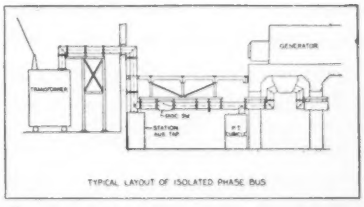
And it's as easy as this to order!

1. Give us a one-line diagram, like this —



2. Plus pertinent information about your building, generator, and transformers.

3. We will quote —



TYPICAL LAYOUT OF ISOLATED PHASE BUS

4. And then build *your* Isolated Phase Bus.

For further information, see your local I-T-E Representative, or write

I-T-E ISOLATED PHASE BUS STRUCTURES

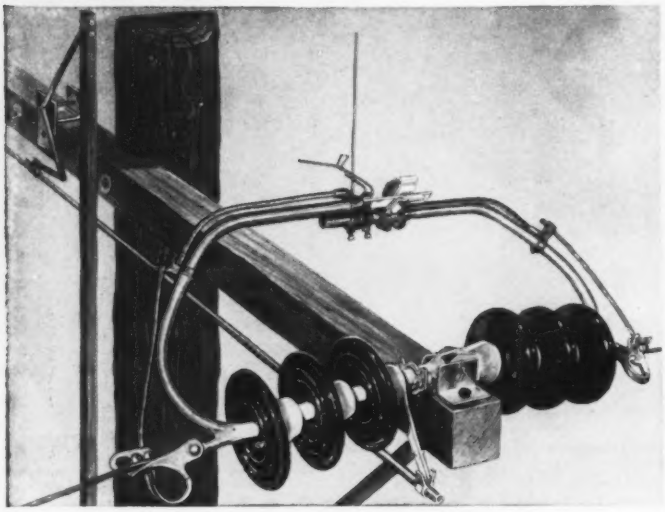
I-T-E Circuit Breaker Company • 19th and Hamilton Streets, Philadelphia 30, Pa.

Power Switching Equipment: Railway and Industrial Engineering, Harrisburg, Pa.

R&IE

SWITCHGEAR • UNIT SUBSTATIONS • ISOLATED PHASE BUS STRUCTURES • CIRCUIT BREAKERS • MECHANICAL RECTIFIERS • RELAYERS • SPECIAL PRODUCTS

KPF **POLE TOP SWITCHES**



Simple design means more switch ...for less money!

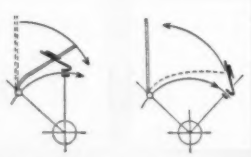
KPF Pole Top Switches cost less because they are simplest in design. They lower installation costs because they bolt on a single crossarm in minutes, require no extra insulators. KPF switches save, too, on upkeep; simple push-pull interphase rods never bind because of crossarm warpage; monel and bronze bearings never need lubrication.

KPF switches may be used in horizontal, vertical or triangular mounting. Free floating, self aligning blades and jaws maintain proper contact under all conditions of switch sag adjustment.

NEW QUICK-BREAK ATTACHMENT FOR KPF SWITCHES

The split-second breaking speed of these new KPF attachments means you can switch many circuits without using expensive circuit breakers. Attachment is available for all KPF switches rated 15 to 69 kv.

WRITE FOR DETAILS



Spring rod winds to full tension as switch opens.

Rod springs clear, breaking contact at high speed.

KPF **ELECTRIC COMPANY**
855 Hovard Street • San Francisco 3, Calif.

continue as long as materials and designs techniques continue to advance.

3. Gas turbines will develop but will not be a source of bulk generation of power. We will soon see capacities up to 10,000 kw in open cycle form. Manufacturers are ready to build 15,000 kw ratings with efficiencies about the same as corresponding size steam turbines.
4. System voltages will be increased probably approaching the 400 kv level. But voltages in excess of 400 kv are doubtful because distances that power is transmitted in this country are relatively short.
5. Series capacitors will be a factor in high voltage transmission. Their use in existing lines may defer going to the next higher power transmission voltage for a long time.
6. Standardization will become more general.
7. Packaged units will be used to a greater extent.

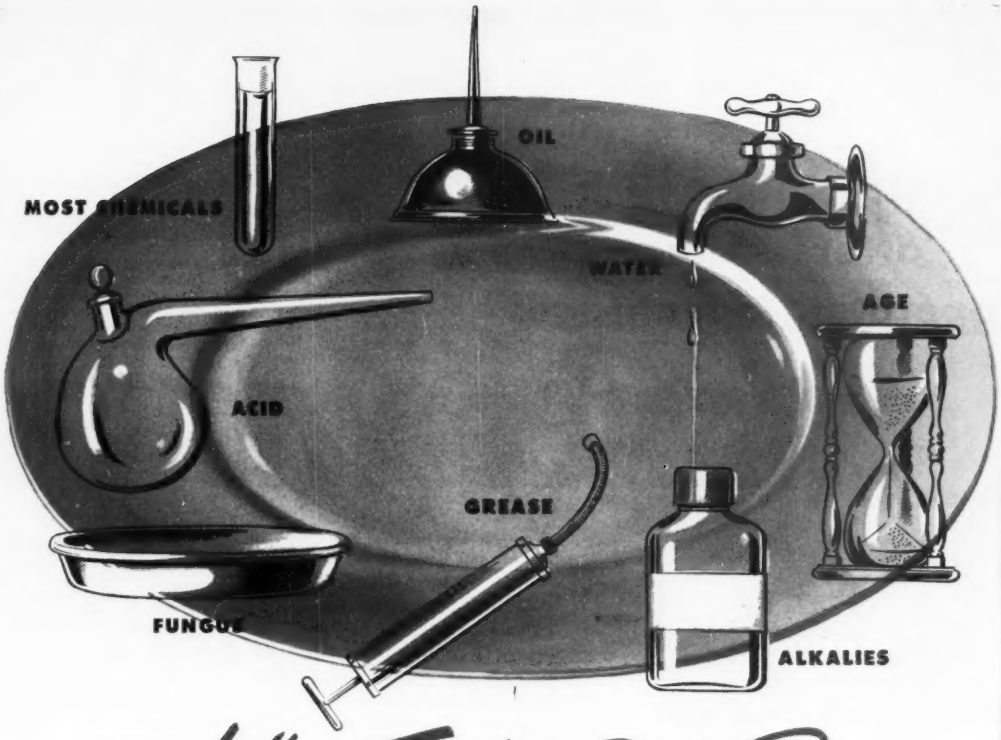
Industry's Five Handicaps

Elmer L. Lindseth, *president, Cleveland Electric Illuminating Co, before the American Management Association, Chicago.*

Five major personnel factors handicap industry in today's efforts to raise production to meet emergency requirements:

1. Lack of employee understanding of the importance of high individual productivity.
2. Shortage of qualified executives.
3. Need for more capable industrial supervisors.
4. Limited manpower
5. The developing scarcity of engineering and scientific replacements.

The type of correctives needed are (1) Cooperation with high school and college educators in supplying information about the American economic system; (2) more emphasis on executive development and compensation patterns; (3) improved selection and training methods for supervisors, (4) permanent retention of emergency employment policies and manpower utilization practices and (5) more participation in the vocational guidance activities of the schools.



Whose Favorite Dish?

It's the favorite dish of cable jacketed with VINYLITE Brand Plastic! This remarkable plastic material thrives on service that's unpalatable to other materials—and you don't pay a premium for it, either.

Obviously, it's a natural for cable used in chemical plants, dairies, breweries, seaside areas, mines, well holes. In actual tests it has remained unharmed in physical and electrical properties after seven years' immersion in water—and twelve years' burial in the ground.

It is resistant to flame, sunlight, heat, cold, and abrasion—and, of course, to oils, greases, alkalies, most strong acids and other chemicals, mildew, fungi and aging.

Non-metallic sheathed cables using VINYLITE Plastic jackets are smooth, small in diameter, clean to handle, mar- and impact-resistant. Highly flexible, they slip easily around corners and through narrow spaces without damage. Cables jacketed with VINYLITE Brand Plastic merit your careful investigation. For further information, write Dept. KG-28.

MEMO TO WIRE MANUFACTURERS

There is a wealth of technical data about properties and uses of VINYLITE Brand Plastics as wire and cable insulating and jacketing materials, in "Kabelitems No. 51," available from Bakelite Company for the asking. It designates VINYLITE Plastic materials best suited both to general-purpose and highly specialized wires and cables, for buildings, machinery, appliances, radios, communications, telephones, police and fire alarms, and many others. Get your copy of this informative, 28-page booklet at once.

Vinylite
BRAND
PLASTICS

TRADE MARK

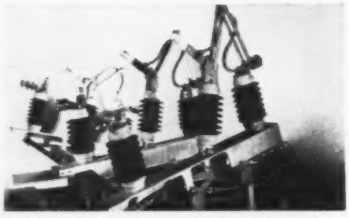
BAKELITE COMPANY
A Division of
Union Carbide and Carbon Corporation
30 East 42nd Street, New York 17, N. Y.

ICE PROBLEMS? Read This...

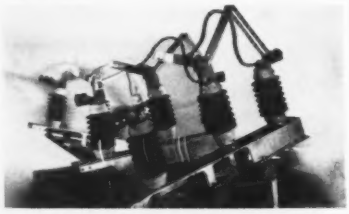
This Chance three phase type WN Switch, with standard controls, was coated in the closed position with over ¾" of hard, clear (bubble-free), ice made with distilled water slowly sprinkled on the switch at various angles to simulate the most severe conditions.

No other switch offers so many operating advantages

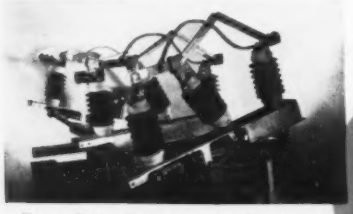
CHANCE WN-VN



"Torture rack" tests proved that performance of the Chance Type WN Switch is not affected by any conceivable warpage of cross-arms. Note side of base is cut away to show control operation.



Note that each switch unit is closing independently of the others. Standard controls were used and no extra leverage was applied. Switch operated easily in spite of the most extreme distortion.



The exclusive Chance Compensator Control mechanism brings all three blades of the switch into completely closed position. No switch or control adjustments were required to compensate for this extreme distortion.

You get top performance under all conditions plus many time, money, and labor saving features when you buy the new Chance WN or VN Gang Operated Switches.

You save on installation because the flanged bases are easy to mount on cross-arms and the interphase shaft can be laid in position after the switch units are mounted—no threading of the shaft is required.

You get dependable operation under all conditions of climate or stress. The exclusive Compensator Control mechanism is housed under the switch base, protected from the weather. This control operates each switch unit independently so that each blade in a three pole switch makes complete contact regardless of warping, twisting, settling or bowing of the wood supporting structure.

A new "crow-bar action" blade, plus the *extra leverage* of the weather protected Compensator Control, makes Chance WN or VN Switches your best buy for performance under heavy ice.

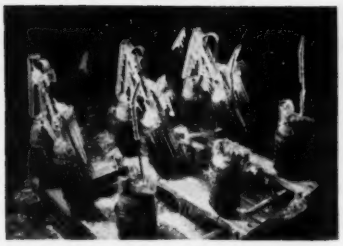
Maintenance time is negligible with WN or VN Switches because all bearings are lifetime lubricated, the flanged bases don't cut into the wood supports and loosen the bolts, and the switch performs properly regardless of structural warpage.

The Compensator Control prevents shock to the insulators and damage to the switch blade in closing, because the closing action is reversed when the control goes through toggle on each individual switch unit. *Slamming the switch closed will not break insulators.* Heavy castings and extra rugged construction also mean long service life without maintenance.

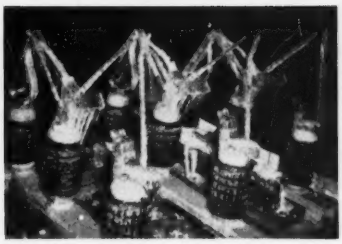
For reliable switching under all conditions, plus time saving installation advantages, specify Chance Type WN or VN Switches. Write for complete information and prices.

Warped Cross-arms don't affect WN or VN

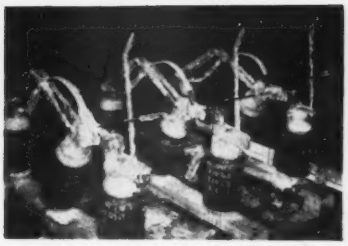
You know



Various tests were made at temperatures from 20° F. above zero to 16° F. below zero. After 12 hours of sprinkling, hard blows with a hammer only chipped the ice, leaving a white mark. Yet, one man at the controls opened the 3 phase switch without difficulty.



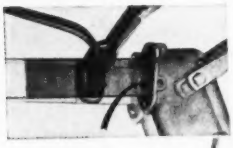
The switch was cleaned and iced again in the fully open position, under the same conditions, with over ¾" of ice on all moving parts of the switch and controls. Operator (background) has started the closing movement.



With standard controls one man closed the three phase switch completely with four chopping blows of the blade. There was no damage to the switch in either of these tests and performance was completely satisfactory

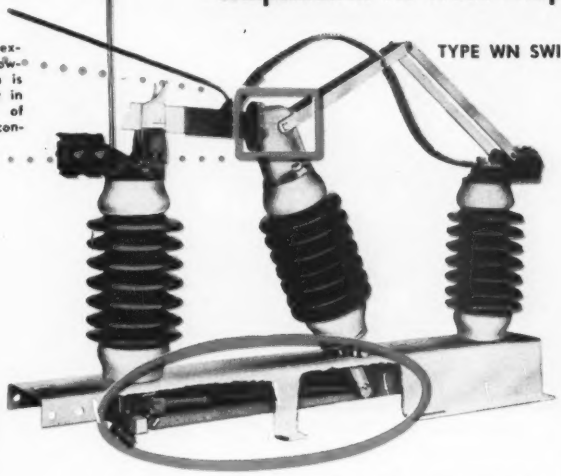
SWITCHES

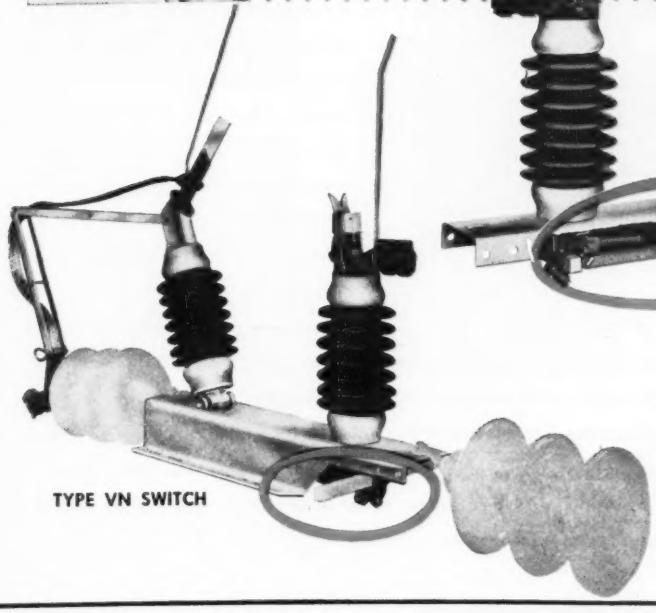
- New Ease of Installation
- Crow-bar Leverage for Ice
- Compensation for Wood Warpage



Double exposure shows exclusive ice breaking "crow-bar action." Pivot pin is forced up against slot in blade — prying rear of blade up ⅜" before contact end is lifted.

TYPE WN SWITCH





TYPE VN SWITCH

COMPENSATOR CONTROL MECHANISM

Cutaway sections of the flanged mounting base show the weather protected Compensator Control that eliminates closing shock and gives extra leverage for smooth, easy operation. This mechanism operates each switch unit independently of the others to give positive, uniform blade contact on all phases. Effect of distortion on the control shaft is negligible, as each blade in a three pole switch arrangement makes complete contact without affecting either of the other two blades.

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A. B. CHANCE COMPANY abc **CENTRALIA, MO., SAN FRANCISCO, CALIF.**

C50-22

This is a piece of Lapp "electrical" porcelain, identical to that which is the body of Lapp insulators and special insulating porcelains. Yet the use of this material in the textile and paper industries is based on its physical and chemical properties. For, to a degree found in few other materials, it is dense, homogenous, non-porous and chemically inert.

Production of this roll is a rather special ceramic achievement. It is made by grinding, lapping and polishing of the porcelain body—to a tolerance of .0002". If you were to pick it up and run your hand over it, you would think it glazed, like a piece of exquisite tableware. In none of our production is the basic quality of Lapp porcelain more evident.

Originally fired as a cylindrical rod of porcelain, it is formed by conventional methods, but somewhat oversize, to permit grinding to final dimensions. On a lathe it is ground, the cut going through the surface to the heart of the body. Any gross imperfections in the body would, of course, be revealed here. But only through lapping and fine polishing becomes evident the inherent cleanness of this body, its total lack of internal imperfections, blebs, minute cracks, low density zones, iron flecks or other contaminants.

And finally, it is obvious that only a uniform, close-grained, hard material would be suited to these machining operations, or would take the quality of mirror-like polish achieved. That is the quality of every piece of Lapp porcelain. We submit that it's a major reason for the superior performance of Lapp porcelain on transmission lines and in electrical systems. It's a reason for you to specify "Porcelain by Lapp" in the electrical equipment you buy. Lapp Insulator Co., Inc., Le Roy, N. Y.

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NEWS ABOUT PEOPLE

Southern California Utility Elects 2 Vice Presidents

W. L. Chadwick, manager of engineering, and J. F. Davenport, an assistant vice president, have been elected vice presidents of Southern California Edison Co.

Chadwick, who served as engineering manager since 1945, was placed

W. L. CHADWICK

J. F. DAVENPORT

in charge of engineering and construction. He joined the company in 1922 as draftsman at the Edison Big Creek hydroelectric project in California's High Sierra. In 1924 he became division engineer there and in 1928 moved to the general office in Los Angeles as transmission engineer. From 1931 to 1937 he was employed by the Metropolitan Water District as engineer and senior engineer. He rejoined Edison in 1937 as a civil engineer and served as chief civil engineer before his appointment as manager of engineering.

Davenport has served the company since 1926. In 1929 be became hydro engineer and in 1931 superintendent of hydroelectric generation. He was named superintendent of generation in 1937 and assistant manager of operation in 1940. After service with the Army Air Corps in World War II he returned to Edison as an assistant vice president.

•

Fred I. Smith Appointed JCP&L Sales Manager

Fred I. Smith has been appointed sales manager for Jersey Central Power & Light Co. He was formerly industrial sales manager for the utility.

Smith joined JCP&L in 1946 after

•

FRED I. SMITH

service in engineering and sales fields with an affiliated company. From 1940 to 1943 he taught elementary electricity in a course offered by a branch of Pennsylvania State College to prepare students for entry into war plants.

•

T. W. Krueger has been appointed assistant general sales manager of Duff-Norton Manufacturing Co, Pittsburgh. He went to Duff-Norton as advertising and sales promotion manager in 1947 from the advertising department of Jones & Laughlin Steel Corp.

Andrews Is Elected VP of Tide Water Power Co

Robert P. Andrews, new business manager of Tide Water Power Co, has been elected vice president of the company. In his new post he will supervise industrial and agricultural development, merchandising, and all division managers.

R. P. ANDREWS

Andrews spent four years in the Navy and worked for National Broadcasting Co before joining the utility in 1945. With Tide Water he has served as assistant advertising manager, advertising manager, merchandise manager, and new business manager.

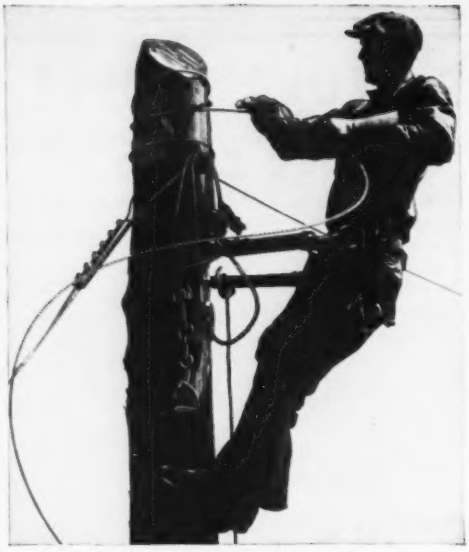
•

Westinghouse Advances Kersh, Roseberry, Others

Robin S. Kersh, formerly manager of central station sales for Westinghouse Electric Corp, has been named manager of the company's Steam Division at South Philadelphia, Pa. He will be succeeded by Carroll V. Roseberry, central station supervisor for the Los Angeles branch territory.

Several other appointments were made recently by Westinghouse. L. D. Rigdon, formerly manager of the headquarters manufacturing department, was made assistant to the vice president in charge of manufacturing. He will be succeeded by C. G. Wallis, director of the headquarters manufacturing engineering department.

Has What It Takes



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INDIANA STEEL & WIRE COMPANY
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Crapo GALVANIZED STEEL STRAND

New manager of manufacturing for the Motor and Control Division is W. G. Miller, who has been assistant works manager.

Kersh has been with the company since 1929. He did sales work in the Atlanta, Ga., and Birmingham, Ala., offices, served in the machinery electrification department, managed the company's Houston, Tex., office, and was manager of industrial sales at East Pittsburgh before being promoted to manager of central station sales in 1949.

Roseberry joined Westinghouse in 1934, became a central station salesman in the San Francisco office, then was made assistant central station manager for the Pacific Coast district, and in 1949 was appointed central station supervisor for the Los Angeles territory.

Rigdon, with Westinghouse since 1909, has held executive posts in connection with shop methods and equipment. During World War II he was manager of manufacturing for the Emergency Products Division and was responsible for overall contract liaison work between the ordnance plants and the Navy Department. Wallis joined Westinghouse in 1923 and has been works manager for the Elevator Division, manager of industrial engineering at the Center Line Naval Ordnance plant, and director of the foreign manufacturing department. Miller, who has been with the company since 1935, has been methods engineer, staff supervisor, and manager of manufacturing in the Canton, Ohio, ordnance plant and manager of the headquarters manufacturing staff in Pittsburgh.

•

General Electric Shifts Prince, Johnson, Edwards

David C. Prince, vice president of General Electric Co, has been appointed to the president's staff, with special duties as assigned. Harry A. Winne, vice president in charge of engineering policy, has been assigned responsibility formerly held by Prince for the GE Engineering Laboratory at Schenectady, N. Y.

Ernest E. Johnson, manager of engineering, Large Apparatus Divisions of the Apparatus Department, has been named to the newly created post of general manager of the laboratory. New engineering manager of the lab is Dr Martin A. Edwards.

Prince started on the test course in

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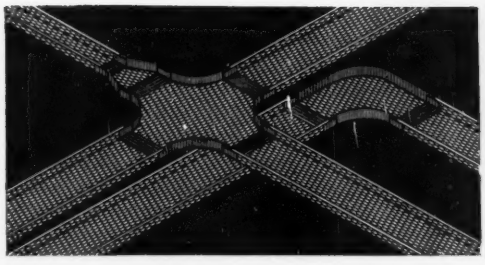

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1913. After three years with the Illinois Public Utilities Commission he returned to GE as an assistant to Dr E. F. W. Alexanderson, radio and television pioneer and then conducted research on vacuum tube applications for the Research Laboratory. Later he became chief engineer of the Switchgear Department and then was made commercial engineer for the company.

In 1941 he was elected a vice president and put in charge of application engineering for the Apparatus Department. Prince was named head of the General Engineering Laboratory in 1945. He has been responsible for design developments in the switchgear, electronic tubes, and other fields. A former president of the American Institute of Electrical Engineers, he received the organization's Lamme Medal in 1946.

Johnson, who went to GE in 1922, has served as assistant to the executive engineer of the Research Laboratory, engineer in charge of the Generator Voltage Regulator Engineering Department, assistant to the Schenectady Works engineer, assistant engineer of the Aeronautics and Marine Engineering Department, and manager of engineering of the Apparatus Department. He has been manager of engineering of the Large Apparatus Divisions since November, 1949.

Edwards joined the company in 1929 and also worked with Alexanderson. Since 1949 he has been associate engineer in charge of the General Engineering Laboratory's technical divisions. He holds 82 patents in the field of industrial controls and has nearly an equal number pending. A three-time winner of GE's Coffin Award, he received the honor for his work on synchronous torque amplifiers for marine applications, systems of amplification and automatic control for high-speed electric machinery, and gas-turbine accessories for the armed services during World War II. AIEE, of which he is a fellow, gave him an award in 1941 for a paper entitled, "Industrial Applications of Amplidyne," of which he was coauthor.

•

R. D. Smith, Jr, El Campo, Tex., manager for Central Power & Light Co for the past four years, has been made manager of the Guadalupe Valley district with headquarters in Victoria. He

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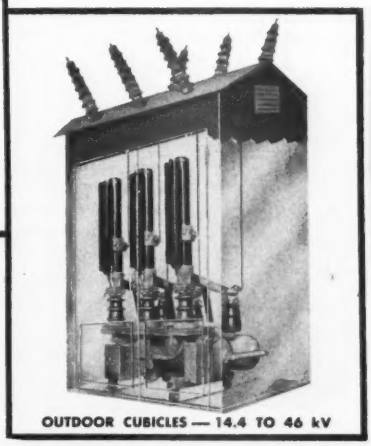

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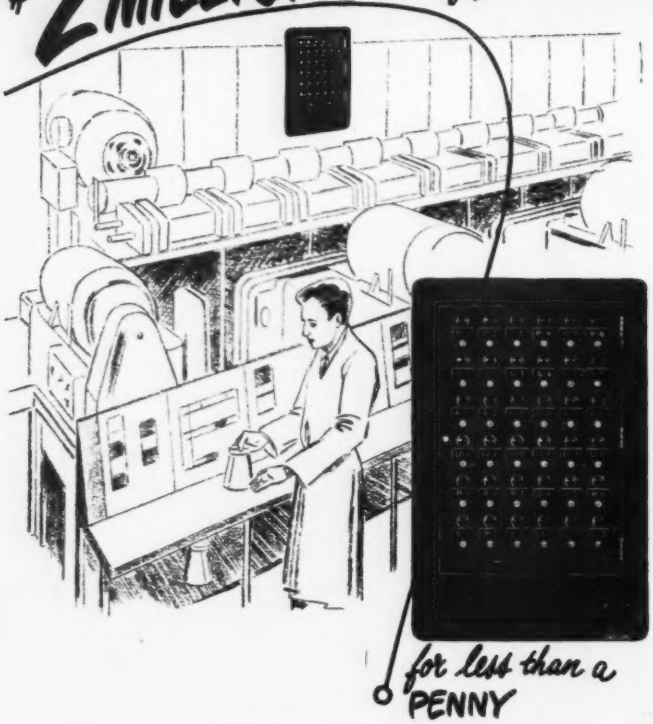

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succeeds the late A. D. Magruder. Smith has been with the utility for 17 years. He started in Uvalde as merchandise salesman and later was local manager at Marfa and sales manager in Corpus Christi.

•

P. R. Mallory & Co Picks Sparrow as Senior VP

Ray F. Sparrow has been named senior vice president of P. R. Mallory & Co, Inc, Indianapolis. He has been vice president in charge of sales since

•

RAY F. SPARROW

1931 and has been a member of the board of directors for many years.

After World War I Sparrow became a salesman of electrical parts and then a manufacturers' agent in the same field. He joined Yaxley Manufacturing Co, Chicago, and in 1931 consolidated that organization with Mallory. Under his guidance Mallory's gross sales have risen from $2 million to more than $35 million in less than 20 years.

•

PG&E Promotes Four as Executives Retire

Several new appointments to replace retiring executives have been made by Pacific Gas & Electric Co.

W. R. Johnson has been appointed chief of the division of hydroelectric and transmission engineering, succeeding John A. Koontz.

A. J. Swank will replace Otto W. Peterson, manager of the general construction department for 30 years. H. D. Wright has been made engineer of line construction, succeeding R. A. Ransdall. E. V. Noe will succeed Frank M. Harris as chief of the bureau of specifications and estimates. Homer

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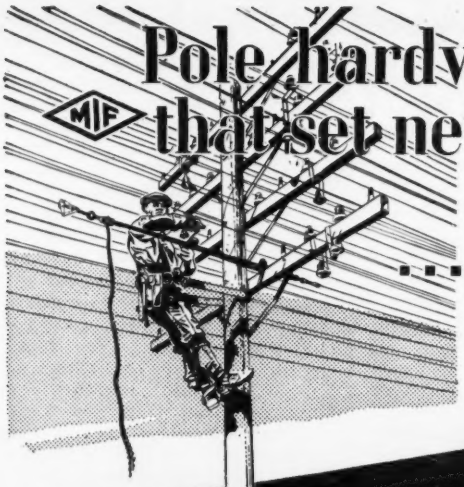
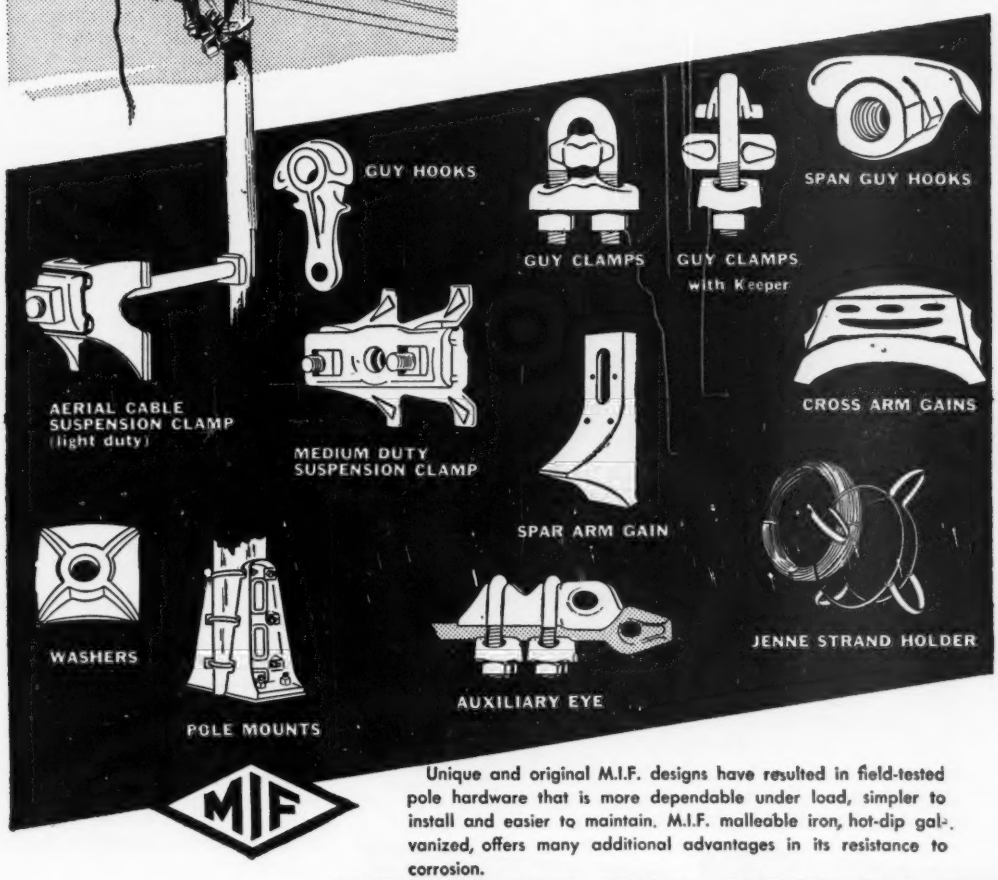
...ease of installation
...long service life





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G. Keesling, superintendent of the central area since 1947 and with the company since 1911, also is retiring.

Johnson has been Koontz's assistant since 1948. He took part in the development of a 2-million-v generator at Ryan high-voltage laboratory, Stanford University. Koontz helped design Caribou and Big Bend powerhouses on California's Feather River for Great Western Power Co. When Great Western merged with PG&E he became assistant in the division of hydroelectric and transmission engineering and later chief.

Swank joined the utility in 1919 and has been construction superintendent, engineer of station construction, and assistant manager of the department of general construction. Peterson was with the U. S. Reclamation Service, Oriental Consolidated Mining Co, and Shattuck Construction Co before joining PG&E in 1913 as superintendent of construction for the Drum Powerhouse project on the Bear River. He directed building of the "Super Inch" pipe line for PG&E.

Wright has been with the company since 1919. Ransdall served with Sierra & San Francisco Power Co before its merger with PG&E. After the merger he was superintendent in the substation division of the construction department, assistant engineer of line construction, and since 1942 engineer and head of the division.

Noe was acting chief of the bureau of specifications and estimates while Harris was on naval leave. He has been with the utility since 1925. Harris has served Pacific Gas & Electric since 1920.

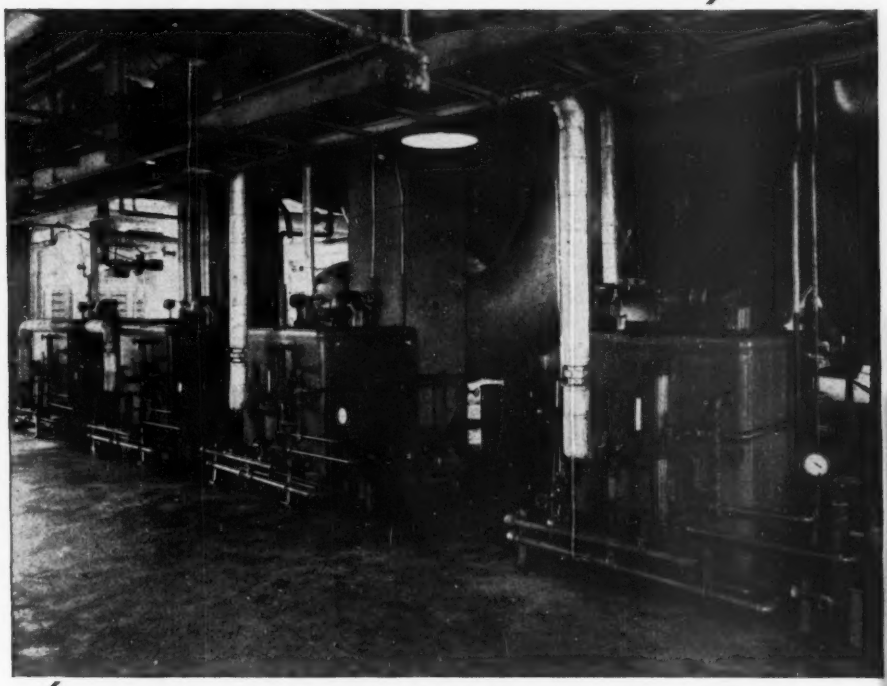
OBITUARY

Robert S. Peare

Robert S. Peare, 50, vice president of General Electric Co in charge of public relations, died March 18 at Schenectady, N. Y. He was manager of the company's publicity and advertising departments.

Peare had been with General Electric since 1922 starting as a student in the company's business training course. He served in the accounting and advertising departments and later became secretary-treasurer of the Maqua Co, a GE printing and engraving affiliate. In 1929 he was made general manager of Maqua and five

Lubrication Insurance for TURBINE BEARINGS



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*NAME ON REQUEST

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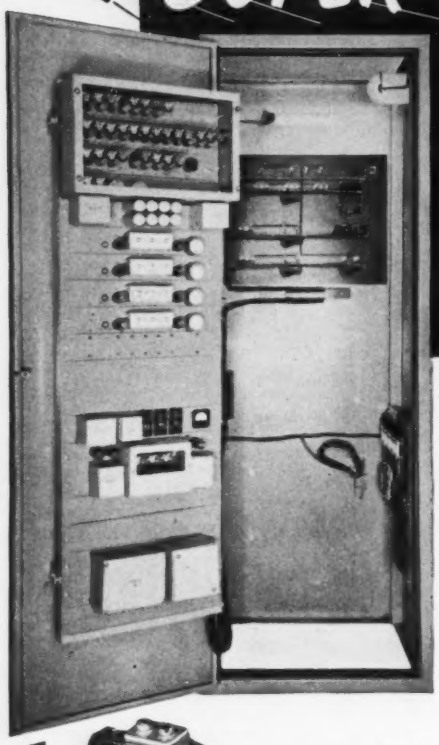
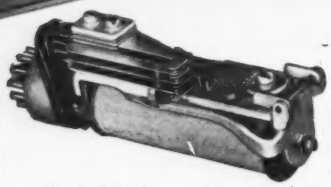


RELIABILITY AND SPEED along with cost, are important points to consider when buying a system of supervisory controls. But any system's initial cost is not the only cost. Cost of maintenance is a major influence to consider, and at this often neglected point, SUPER-TROL has proven superior in many types of installations.



SUPER-TROL'S fast speed of operation with low speed of component parts makes checking of equipment easy and inexpensive. SUPER-TROL'S basic simplicity is more reliable and is easier for maintenance men to understand.

To aid you in holding down maintenance costs, all relays, wiring and other components are mounted on swinging panels for easy accessibility, inspection, and repairs if necessary. Simplicity of circuits together with plug mounted relays and swinging relay panels permit faster, easier replacement.

Write for Bulletin AA-2 which explains Control Corporation's System of Supervisory Control.

*SUPER-TROL is Control Corporation's modern method of remote, supervisory control.

CONTROL CORPORATION

719 CENTRAL AVE. • MINNEAPOLIS 14, MINN.

years later was appointed its president.

In 1940 Peare returned to GE as manager of the publicity department

R. S. PEARE

and in 1944 was elected a vice president. In addition to general publicity activities he supervised broadcasting over the company's radio and television stations.

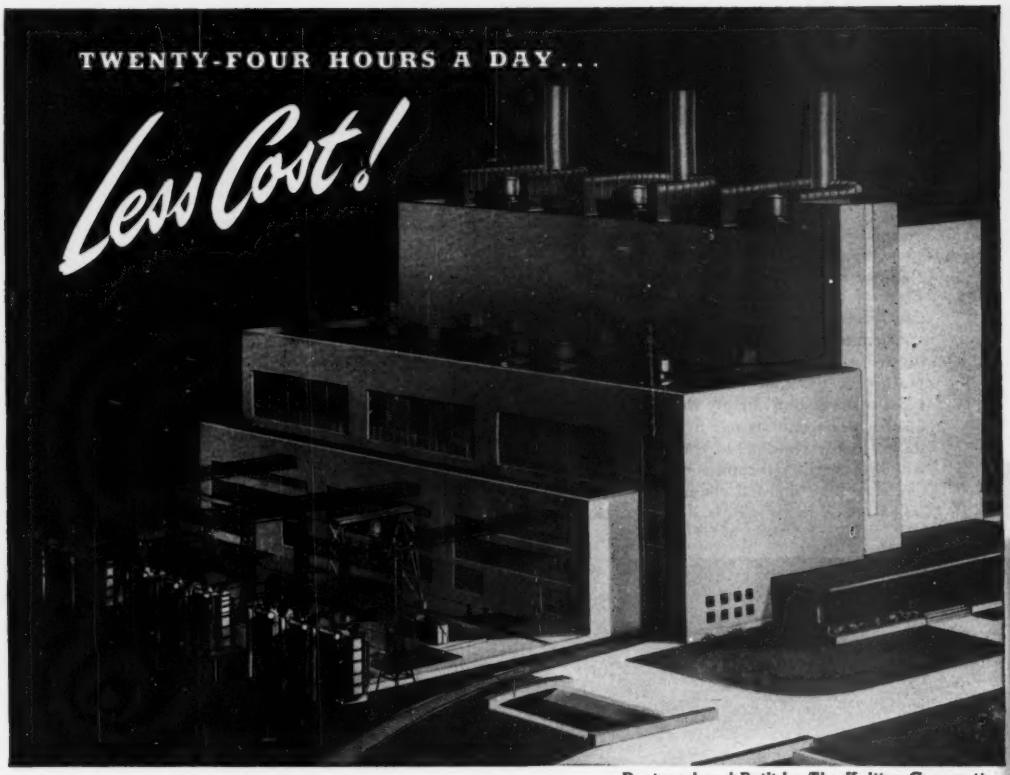
The National Association of Public Relations Counsels, Inc, honored Peare in 1946 for his contributions during that year "toward the improvement of the techniques and application of public relations from the professional and ethical standpoint."

•

R. D. McCarter

Robert D. McCarter, 78, consulting electrical engineer who designed and built public utility plants in a number of countries, died March 10 in New York City. He had served as chief engineer of the London export office of General Electric Co and as a vice president of several continental Westinghouse Electric Corp branches.

Among jobs he had held were those of partner in McCarter & Cooper, which specialized in caring for American interests abroad and foreign interests here; vice president of John W. Cowper & Co, Buffalo, N. Y., engineers and contractors; vice president and managing director of the Societe Electrique Westinghouse de Russie; a consulting engineer or general manager of public utility concerns in England, Scotland, Argentine, Spain, and Egypt; vice president of European Gas & Electric Co of London and New York; and executive vice president of American Chrome & Magnesium Industries, Inc, Seattle. From 1942 to 1945 he served on the War Production Board.



Designed and Built by The Kuljian Corporation

Electric power producers are under more constant pressure than almost any other industry.

They must be prepared to carry normal loads around the clock year after year and meet large unexpected demands at any hour. They must be sensitive to every industrial and commercial need.

Under such trying conditions, it is basic that efficient operating practice alone is not enough. Utmost economy and reliability must be *built into* each generating unit from the start.

For more than a score of years, Kuljian engineering and Kuljian construction methods have been building long life and money saving efficiency into power plants for both public utilities and large industrial plants.

WASHINGTON, D. C.
ROME, ITALY
CALCUTTA, INDIA
CARACAS, VENEZUELA

The Kuljian Corporation

ENGINEERS • CONSTRUCTORS

1200 NORTH BROAD STREET, PHILADELPHIA 21, PA.

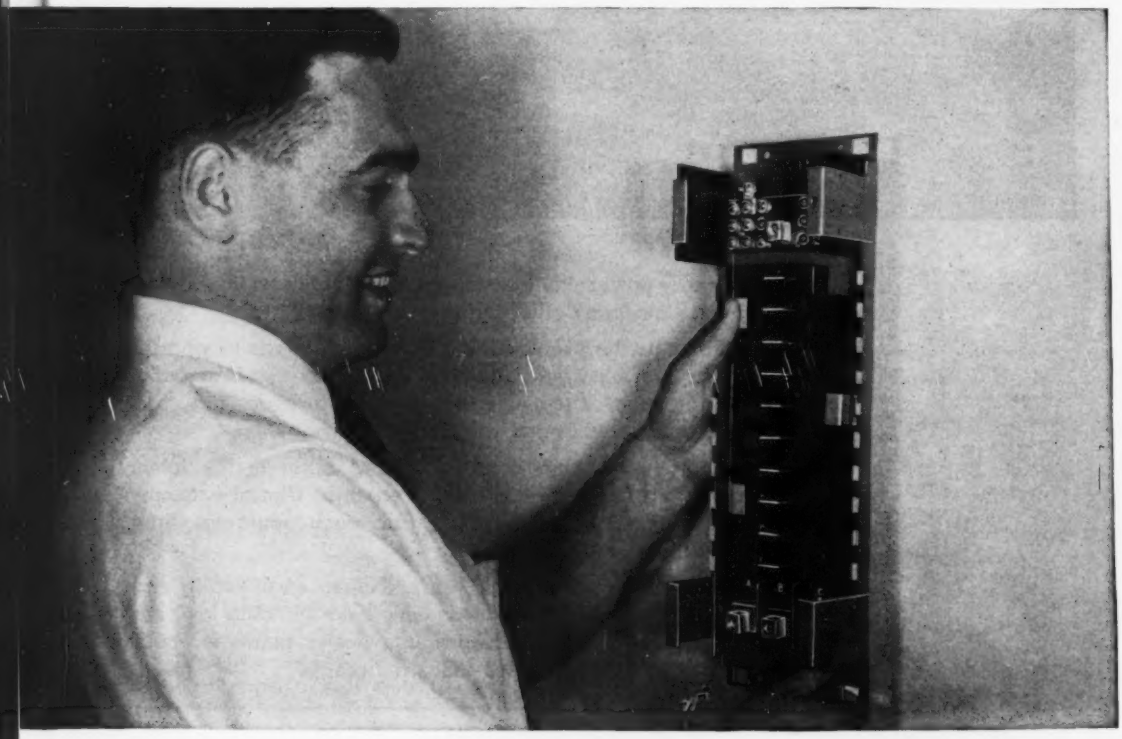
INTRODUCING A PANELBOARD WITH A PLASTISOL HEART

Now—for the first time—a new insulating material, Plastisol, is used as the heart of a complete line of panelboards.

The interior of Trumbull's new NLTQ Panelboard is formed with bus bars *molded in* a plastisol base. This plastisol material has many advantages over all other types of insulation: highly resistant to either acid or alkali; no harmful aging; no shrinking or embrittlement; highly resistant to tracking and carbonizing; will withstand temperatures of 212 F without harm; has very high thermal conductivity (even at minus 30 F) and is an excellent radiator of heat. Tests show copper bus bars encased in plastisol run 10% cooler than in open air!

Trumbull's plastisol base is Underwriters' Laboratories, Inc. approved, and is completely endorsed by The Electrical Council.

The NLTQ Panelboard is furnished with lug-in mains or circuit breaker mains in capacities up to 225 ampere bus bars, in a range of 4 to 42 circuits. 3-wire, 120/240 volt A-C or 4-wire, 3-phase, 120/208 volt A-C, solid neutral. Provision can be made for increasing any bus capacity up to 210 amperes; also sub-feed, meter loop, through feed and split bus. ***Write for Bulletin TEB-14.***



NEW INTERIOR SAVES INSTALLATION TIME, PROVIDES SEQUENCE PHASING

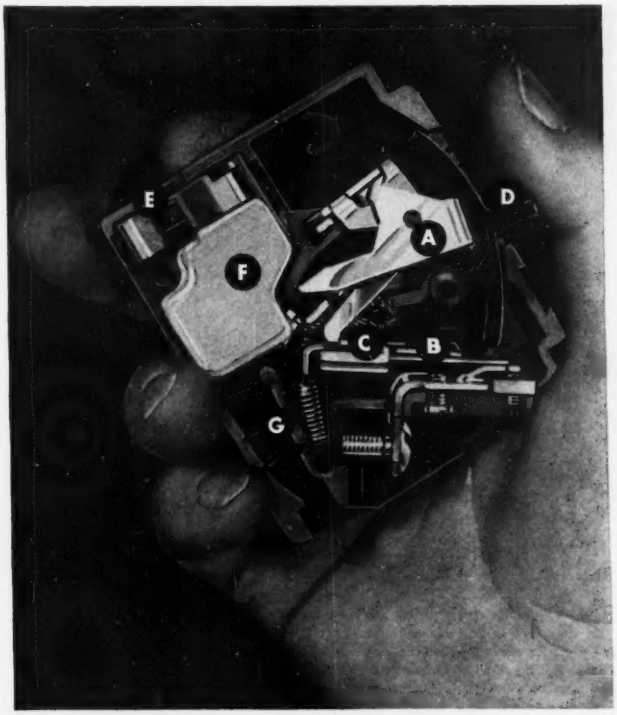
The interior is compact, allowing ample room for wiring. As shown in the picture at the right, it is mounted in the box by means of four posts and compression springs; this speeds installation, permits removal for ease in wiring.

The bus bar and stab assembly is silver-plated copper for positive conductivity. Line terminals are heavy-duty, silver-plated, solderless.

Another unique feature of this interior is that by ingenious design, sequence phasing is built into the Panelboard. Each adjacent Breaker is on an alternate phase, which assures balanced loads and circuits.

Phases are permanently identified by molded-in letters.

You've never before seen a CIRCUIT BREAKER like this in a panelboard



QUICK-MAKE, QUICK-BREAK Trumbull's new TQL interrupts with a *snap*. No matter how sloppily the handle is operated, the movable contact arm (A) opens or closes *fast* and *clean*... reduces burning or arcing of contacts.

DOUBLE PROTECTION *thermal and magnetic* Trumbull's new TQL trips automatically by (B) time-delay thermal action of excessive overload (but not by harmless temporary overloads) or by (C) instantaneous magnetic action for short circuit.

TRIP-INDICATING When an overload or short circuit causes the Breaker to trip, the handle (D) moves to mid-position between OFF and ON where it is easily observed from a distance.

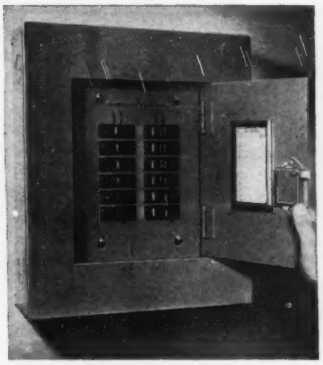
TRIP-FREE Trumbull's new TQL Breaker automatically trips independently of the handle—it trips for a fault condition even though handle is held in ON position.

OTHER FEATURES Pressure-type silver-plated copper contacts (E)... arc chute (F) made of special refractory material . . . exhaust chamber (G) to cool gases . . . completely tamper-proof . . . Underwriters' Laboratories Inc. approved.

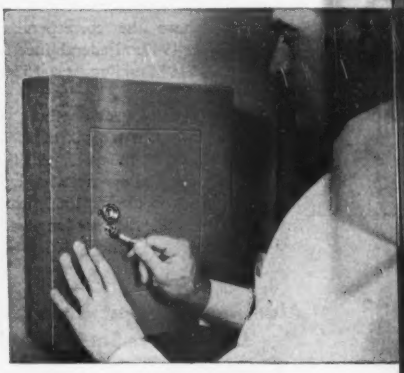
INTERCHANGEABLE All ampere ratings are physically interchangeable.

RATINGS 15, 20, 30, 40, 50 amp; 120 volt A-C, single pole, single throw. Interrupting: 5000 amp. 120 volt A-C, 120/240 volt A-C. Two-pole operation, independent trip, possible with handle extensions.

COMPRESSION SPRINGS save nuisance of nuts and washers, allow fronts to be lined up regardless of uneven box installation.



ONE-PIECE WELDED ASSEMBLY of front and barrier saves installation time. Front is attached to interior by means of four screws.



COMPLETELY PROTECTED With door locked, screws are concealed, front cannot be removed. Note attractive appearance; invisible hinges.

TRUMBULL (T) ELECTRIC

THE TRUMBULL ELECTRIC MANUFACTURING COMPANY

PLAINVILLE, CONN.

MANUFACTURERS and MARKETS

General Electric Profits Hit Record High in 1950

General Electric Co and its consolidated affiliates earned a net profit of $173,424,000 for 1950, a record total 38% more than previous peak earnings of $125,639,000 for 1949.

Net earnings last year were equivalent to 8.7¢ per dollar of total revenue and to $6.01 per share of common stock, compared to 7.7¢ and $4.36, respectively, for the preceding year.

Net sales to customers totaled $1,960,429,000, another record and 22% more than 1949's sales of $1,613,564,000. Sales increased in each succeeding quarter of 1950 to a total of $605,946,000 in the final three months of the year, a new peak for quarterly sales volume.

Of the 1950 net profit 56%, or a record amount of $97,060,000, was declared as common dividends. This amount, equivalent to $3.40 a share, was 36% over 1949's $2.50 a share.

Provision for all taxes for the year totaled $299,446,000, another record and 97% above the corresponding provision for 1949. Federal income taxes took $197 million, or 153% over the 1949 total.

Number of employees on the payroll increased to a new peak of 200,419 at the close of the year. All the company's outstanding note obligations were paid off during 1950, leaving the company with no long-term debt for the first time since 1946.

•

Aluminum Output Rising; Copper Use Sets Record

American aluminum production last year was 19% above that of 1949, the Aluminum Association reports. Primary output during the final quarter of 382,176,940 lb brought the year's total to 1,437,255,518 lb. Shipments of sheet and plate by association members increased 48%, to 1,155,318,982 lb.

In the same period a new peacetime record in use of copper was set, with total deliveries containing 1,440,895 tons. This was the best for any year since 1945, when the total was 1,462,440 tons, and was 412,274 tons more than the 1,028,621 tons consumed in 1949. Stocks of refined copper held by fabricators aggregated 289,313 tons at the end of December, an increase of 11,723 tons over those at the end of November and the first gain in stocks since the end of March.

Domestic copper production last year increased 20% to hit its high since 1944. Output totaled 907,000 short tons last year, according to Bureau of Mines figures.

CHECKS by the pouchful are ready (above) to go to General Electric Co stockholders. Acting Postmaster at Schenectady, N. Y., Walter J. Reagles views the approximately 245 mail pouches required to handle some quarter of a million dividend checks—the city's biggest individual mailing to date

Metal Prices
March 19, 1951

COPPER, Conn. V., lb	$ .24½
LEAD, N. Y., lb	.17
ZINC, prime Western, E. St. Louis, lb	.17½
TIN, Straits qual., N. Y., lb	1.34
ALUMINUM, ingot, base price	.19
NICKEL, base price	.50½
STEEL, billets, Pitts., ton	56.00
STEEL, scrap, No. 1 heavy, Pitts., ton	45.00

Combustion Engineering Starts New Service Plan

Combustion Engineering - Superheater, Inc, New York, has put into operation a new plan of customer service designed to minimize difficulties in maintaining schedules to meet project requirements and to keep customers informed on the status of their jobs.

The company has assigned one salesman in each of its districts to act in a liaison capacity between customers and the contract, production, and purchasing departments in New York. Combustion Engineering has brought one of its district managers into New York to act as a production coordinator and to supervise the work of the special field squad.

Under this new system, the field man is expected to keep in constant touch with customers in his district and to relay to New York any changes in their plans which might affect the company's scheduling, production, or shipment. He also can expedite the shipment of materials and equipment by informing the customer immediately if his job is subject to delay because of incomplete information or other circumstances which the customer might be able to rectify.

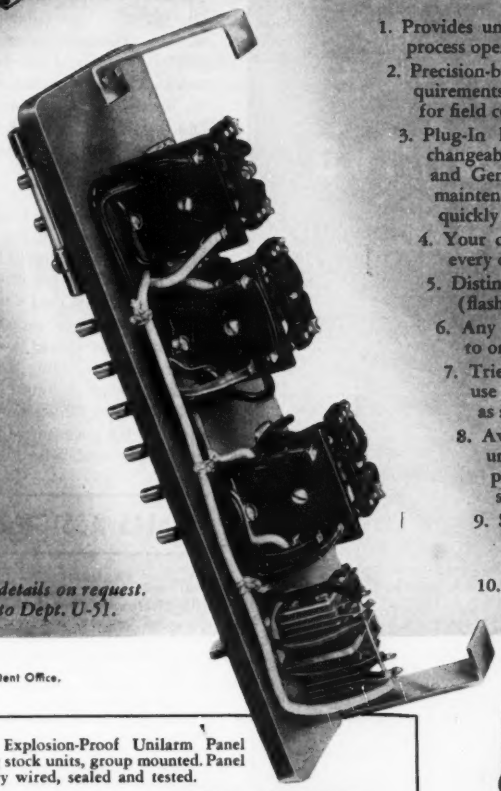
MANUFACTURING BRIEFS

General Electric Co has purchased a major part of Union Bag & Paper Corp's Hudson, N. Y., plant facilities for manufacture of capacitors. Union Bag has concentrated its manufacturing operations at Fenimore, N. Y., across the Hudson River, and at Savannah, Ga. The purchase includes two three-story buildings, a two-story building, and a one-story office building, as well as three one-story warehouses.

Westinghouse Electric Corp will build a new plant for production of small electric motors in Union City, Ind. Production is expected to start late in 1951. Ralph E. Davis, who has been

No Other Alarm System Has ALL The Advantages Of

R&S UNILARM*...



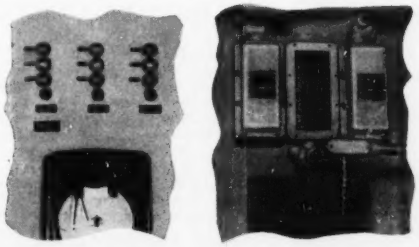
1. Provides unfailing supervision of equipment and process operations.
2. Precision-built to Underwriters' Laboratories requirements. Completely wired and tested . . . ready for field connections.
3. Plug-In Panel (large illustration), fits interchangeably into Explosion-Proof, Vaportight and General Purpose enclosed units. Reduces maintenance to a minimum . . . easily and quickly replaced with a spare unit.
4. Your choice of 100 standard circuits to suit every conceivable application.
5. Distinctive visual signal for each condition (flashing light) insures immediate attention.
6. Any number of Unilarms may be connected to one audible signal.
7. Tried and tested in the field. Thousands in use giving trouble-free protection. Accepted as standard by leading industries.
8. Available as individual unit or in multi-unit Panels. Also time delay types for applications subject to high surge or excessive vibration.
9. Saves space, engineering costs, installation and maintenance over other alarm systems.
10. Acknowledgement-test switch permits periodic testing of each Unilarm circuit.

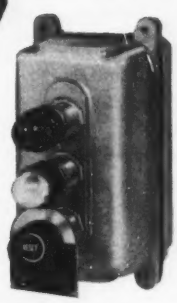
Complete details on request. Write to Dept. U-51.

*Reg. U.S. Patent Office.

D1

Special Explosion-Proof Unilarm Panel showing stock units, group mounted. Panel is factory wired, sealed and tested.





Vaportight Unilarm

General Purpose Unilarm

R&S Unilarm is also available in a complete line of Surface Mounted Types — Explosion-Proof, Vaportight and General Purpose.

RUSSELL & STOLL

RUSSELL & STOLL COMPANY, INC. • 125 BARCLAY STREET, NEW YORK 7, N. Y.

PRECISION-BUILT ELECTRICAL EQUIPMENT—SINCE 1902

If you've ever been up on a 50-foot stick when your life depends on the quality of the belt and safety strap you use, you will appreciate the high quality and care that is so much a part of all Klein equipment. When life's at stake, there can be no compromise with quality. Old timers know that Klein equipment has stood for quality in linemen's tools and equipment—"since 1857."

ASK YOUR SUPPLIER

Foreign Distributor:
International Standard Electric Corp.
New York

If you have not received a copy of the new Klein Pocket Tool Guide, write for one. It will be sent without obligation.

Mathias KLEIN & Sons
Established 1857
Chicago, Ill., U.S.A.
3200 BELMONT AVENUE CHICAGO 18, ILLINOIS

plant superintendent at the Westinghouse small motor plant at Bellefontaine, Ohio, will be in charge of the new plant. Two buildings totaling some 120,000 sq ft of floor space have been leased in Lima, Ohio, for additional expansion of the Small Motor Division there.

Corboloy Co, Inc, a General Electric Co affiliate, has launched a $2.8-million expansion program to meet increasing demand for tungsten carbides. About $2 million will be spent for a new plant in Edmore, Mich., and the remainder will be used to increase facilities at the present Carboloy plants in Detroit.

Kaiser Aluminum & Chemical Corp has cleared its debt to the government 23 years before maturity and has become 100% privately financed. The company recently paid a total of $37,394,250 in purchase mortgages on five aluminum plants, sold as war surplus under contracts calling for installment payments over a long period. This brings to $56,313,798 the total received by the government in principal, interest, and rentals for these facilities.

SALES ASSIGNMENTS

COMPANY STAFFS

Allis-Chalmers Manufacturing Co has appointed several new sales representatives to general machinery division offices. Appointees in the Atlantic region are John W. Becker, assigned to Syracuse; Joseph L. Luber, Washington, D. C.; Joseph M. Duncan, Atlanta; Charles C. Leach, Philadelphia; and Floyd Blackwell, Jr, Chattanooga. Named in the North Central region were David C. Emery, Cleveland; William V. Glasser, Omaha; and James R. McCausland, St. Louis. John Rayburn was made a sales representative in the Amarillo district office.

Independent Pneumatic Tool Co, Aurora, Ill., has transferred three branch managers and appointed a new one. John B. Dempsey has been named manager of the Detroit branch. He will be succeeded as Pittsburgh manager by Edward W. Krantz. William J. McGraw will replace Krantz as New York branch manager. Clarence B. Bergren, service engineer in the St. Louis territory, was named Cleveland branch manager to succeed McGraw.

REPRESENTATIVES

Ward Leonard Electric Co, Mount Vernon, New York, has appointed Maury E. Bettis Co, 3319 Gillham Rd, Kansas City 3, Mo., industrial and electronic sales representative for the Kansas City area.

Knaus-Glaser & Co, representative for a number of electrical manufacturers, has opened a new office at 3117 West McNichols Road, Detroit 21, Mich.

ELECTRICAL WORLD
Headline Feb. 12th

Utilities Will Sell in '51 If—

Electrical World Survey Shows Practically All Electric Companies Will Spend More for Sales Promotion, Will Promote Residential Use

Selling plans of electric utilities for 1951 are ambitious, judging fr...

IF —they can maintain the high quality of materials they have taught their customers to expect in equipment purchased through the advice of the utility

—as in standard merchandise such as Certified Lamps·RLM or Fleur-O-Lier fixtures-Certified Fluorescent Ballasts and Starters—these being manufactured subject to certification tests and inspections.

Many manufacturers have ETL reports which they provide on application, to insure against the OUTAGES in revenue arising from defects in product makeup.

In the present and imminent shortages of materials and skilled labor — precautions in purchasing are of even greater importance than in normal times.

Know ETL by Test

ETL services to production stability are condensed in this booklet. Copy on request.

ELECTRICAL TESTING LABORATORIES, INC.

2 EAST END AVENUE at 79th STREET

NEW YORK 21, N. Y.

These symbols mean

INFINITE VARIETY

in

ELECTRIC SWITCHING

They are the shapes of contacts used in ESCO multi-pole, rotary, detent switches. These elements, specially grouped to meet your particular switching requirements, give single-handle control of complex circuits.

An infinite variety of circuit sequences can be obtained by proper assembly of ESCO contact terminals, rotor blades, detent plates, and frame elements. Whatever the control function you require . . . it can be obtained with an ESCO switch.

THESE SPECIFICATIONS cover wide operating needs

Ratings 10A, 125 VAC/5A,125 VDC
Poles . . . . . One to 40
Positions . . . . . 4, 8, or 16
COST . . below that of most "standard" switches

Write today for your FREE copy of Catalog 1950-JR.

ELECTRO SWITCH CORPORATION
167 King Avenue, Weymouth 88, Mass.

NEW ELECTRICAL CONSTRUCTION

NEW ELECTRICAL construction projects announced by private and government utility systems involving more than $70,000. Also listed are major industrial and construction jobs where electrical work is included

UTILITIES

Proposed Construction

California—Bureau Reclamation, Dpt. Interior, Bldg. 1-A, Denver Federal Center, Denver, Colo., furnishing, del. f.o.b. cars shipping point or f.o.b. cars Roseville, Calif., hydraulic turbines for Folsoim Power Plant, Central Valley Proj., Spec. DS-3344. L. N. McClellan, ch. engr.

California—Bureau Reclamation, Dpt. Interior, Bldg. 1-A, Denver Federal Center, Denver, Colo., furnishing, del. f.o.b. cars shipping point or f.o.b. cars Strathmore, one motor-control switchboard and one distribution switchboard for Pumping Plant L-4, Lindmore Irrigation District, Central Valley Proj., Spec. DS-3339. L. N. McClellan, ch. engr.

Colorado—Bureau Reclamation, Bldg. 1-A, Denver Federal Center, Denver, Colo., furnishing, del. f.o.b. cars shipping point or f.o.b. cars Loveland, Colo., cable fault locator, proof tester, cable, fault test set, motor-driven megger test set, etc. Adams Tunnel cable circuit, Colorado Big Thompson Proj., Spec. DS-3349. L. N. McClellan, ch. engr.

Fla., Jacksonville—City, City Hall, constr. 13 kv transmission line extension on Heckscher Dr. to St. Regis Paper Mill and beyond, Spec. 1046. Utilities Engineer-Mgr., Utilities Bldg., engr.

Idaho—U. S. Eng., 4735 E. Marginal Way, Seattle, 4 Wash., design, mfg. and installation three 15,800-va generators for Albeni Falls power plant, Inv. No. CIV-ENG 51-43, Priest River.

Ia., Osage—City Bd. Trustees, Osage, Sect. 1, bldg. imprv., Sect. 3, mech. work, Sect. 4, electrical work. This bidding does not incl. generating equipment. Buell & Winter, 508 Ins. Exchange Bldg., Sioux City, Ia., engrs.

Kentucky—Grayson Rural Electric Cooperative, Grayson, 477 mi. rural distr. lines, sys. imprvs., Carter Co. **$1,000,000.**

Mass., Woburn—Sylvania Electric Products, Inc., 70 Forsyth St., Boston, brick, steel, 100,000 sq. ft. factory, North Woburn, **$1,000,000.**

Minn., Albert Lea—Freeborn-Mower Cooperative Light & Power Assn., Garbisch, warehouse and office, $100,000. Plans deposit $25. Long & Thorshov, 400 Metropolitan Life Bldg., Minneapolis, archts.

Missouri—Citizens Electric Corp., Ste. Genevieve, 62 mi. rural distr. lines, 43 mi. transmission line, two 10,000 KVA substations, sys. imprvs., Ste. Genevieve Co. **$1,360,000.**

New York and New Jersey—Port of New York Auth., 111 8th Ave., New York 11, N. Y., third tube for Lincoln Tunnel under Hudson River from New York, N. Y., to Weehawken, N. J., **$85,000,000.**

O., Miamisburg—Dayton Power & Light Co., Gas and Electric Bldg., Dayton, install two 60,000 kw. generators in new sect. Hutchings station; extend 66,000 volt power line from Terminus at Xenia to Washington Court House; extend 66,000-volt line from Waynesville to Wilmington; extend. 66,000-volt line from Crown Station in Dayton to West Manchester; change present 33,000-volt line serving St. Marys, Celina and Coldwater to 66,000-volt. Total cost **$30,000,000.**

Oklahoma—U. S. Eng., Box 61, Tulsa, Okla., electric power house and equip. installation on Tenkiller Ferry Dam on Illinois River, 7 mi. north of Gore, Sequoyah Co. $2,225,000. Plans deposit $50.

Okla., Ponca City—City, power plant addn., $100,000. Plans deposit $25. W. R. Brown, First Natl. Bldg., archt.

R. I., Westerly—Narragansett Electric Co., 49 Westminster St., Providence, generating plant, 5,000 kw-5 diesel electric generators electric and auxiliary equip. off Bradford Rd. **$1,000,000.** Charles A. Maguire Assoc., 1015 Turks Head Bldg., Providence, consult. engrs.

Washington—Bonneville Power Admin., P. O. Box 3537, Portland, Ore., addnl. 115-kv transmission line Bremerton to Allyn. Kitsap and Mason Counties. **$890,000.**

ELECTRICAL and MECHANICAL ENGINEERS

METALLURGISTS, PHYSICISTS and CHEMISTS

You're on the main line to the top when you work at Westinghouse

UNLIMITED OPPORTUNITIES
IN DESIGN, RESEARCH, APPLICATION, DEVELOPMENT

INVESTIGATE IMMEDIATELY!

*Engineers fill 16 of the 29 top executive spots in Westinghouse. Hundreds of engineers hold high-level staff and supervisory positions. Your opportunity to advance is practically unlimited at Westinghouse.

*Right now Westinghouse is building seven new plants. These are not temporary jobs. Nearly all of the engineers and scientists who joined us in World War II are still with us, and in the past 10 years our total employment has almost doubled.

*At Westinghouse you will participate in the nation's defense effort. In 1951 a large part of all Westinghouse production will be to satisfy the nation's military needs.

THIS MAY BE YOUR OPPORTUNITY TO MOVE AHEAD IN THE CAREER OF YOUR CHOICE . . . MANY SUPERVISORY POSTS IN NEW PLANTS AND DIVISIONS WILL BE FILLED FROM OUR ENGINEERING STAFF! INVESTIGATE!

Minimum Experience Required—2 years . . . but some of these openings call for top-flight men with more experience.

Salaries—Determined individually on the basis of the experience and ability of the applicant.

Location—There are openings for engineers, metallurgists, physicists, and chemists at most of Westinghouse's 36 plants. For example: You'll find opportunities to do jet engine work at Kansas City, Missouri and South Philadelphia, Pa. . . . in Ordnance manufacturing at Sunnyvale, California and Sharon, Pa. . . . on atomic power projects in Pittsburgh, Pa. . . . in radar and electronics at Baltimore, Md. . . . in aircraft equipment and fractional horsepower motors at Lima, Ohio . . . and in commercial and airport lighting at Cleveland, Ohio . . . and in power producing equipment to speed the production lines of America. And all of these activities have a definite and established peacetime application.

WESTINGHOUSE OFFERS YOU IN ADDITION TO GOOD PAY

- **—Help in finding suitable housing**
- **—Low cost life, sickness and accident insurance with hospital and surgical benefits.**
- **—Modern pension plan**
- **—Opportunity to acquire Westinghouse stock at favorable prices**
- **—Privilege of buying Westinghouse appliances at employe discount**

Investigate Westinghouse today . . . write Mr. R. P. Melly, Westinghouse Electric Corporation, 306 Fourth Ave., Pittsburgh 30, Pa.

Treat your poles right!
Protect them with clean, certain Penta Preservative
Penta-protected poles and cross arms are clean! You'll have lots of praise—and no complaints—from line crews and customers when you specify clean Penta Preservative treatment.
You can absolutely depend on Penta for protection from insect attack and decay. Even after years of service, you'll find no ground line decay, shell rot, top rot, or insect damage in Penta-treated poles and cross-arms.
That's because PENTAcholorophenol is a powerful, stable and uniform wood preservative—allows measured and positive protection. It's always the same! Penetrates deeply into the wood and will not leach out. Doesn't affect conductivity, creates no special problems.
Specify PENTA treatment for safeguarding your poles, cross-arms and other wood construction. It costs no more than other types of preservation. Write us for complete facts and names of companies supplying Penta-treated products.
CHAPMAN CHEMICAL COMPANY
333 N. Michigan Ave. • Chicago 1, Illinois
Dermon Building • Memphis 3, Tenn.
CHAPMAN
Penta Preservative
Conforming to A. W. P. A. Specifications P8-49 and P9-49.

Wash., Wenatchee—Chelan County Public Utility Dist. 1, c/o Stone & Webster Eng. Corp., engrs., 49 Federal St., Boston, Mass., 13 compressed-air circuit breakers of 1,500,000 kva. interrupting capacity of Rock Island Dam.

Wisconsin—Wisconsin Public Service Co., 1029 N. Marshall St., Milwaukee, 5000 kw. hydro-electric plant at Menard Isle in Wisconsin River, Tomahawk, Lincoln Co. **$2,100,000.**

Alaska, College—Alaska Pub. Wks., Dpt. Interior, Juneau, steam and electric generating plant and distr. sys. for University of Alaska campus. **$208,350.**

Alaska, Whittier—U. S. Eng., (APO 942, c/o PM, Seattle, Wash.), Anchorage, heat and power plant. **$1,500,000.** Bechtel Corp., 220 Bush St., San Francisco, Calif., consult. engrs.

Low Bidders & Contracts Awarded

Colorado—Westinghouse Electric Corp., G. & E. Bldg., Denver, Colo., Low Bidder, **$357,700**, generator (second unit) for Flatiron Power Plant, Colorado-Big Thompson Proj., Spec. DC-3279, Bureau Reclamation, Dpt. Interior, Bldg. 1-A, Denver Federal Center, Denver, Colo. Bids Feb. 21.

Ind., Bluffton—Fairbanks-Morse Co., 600 S. Michigan Ave., Chicago, Ill. Contract Awarded, **$294,460**, municipal Power plant Imprv. Second Unit, 2500 kw diesel generator. Bd. P. Wks., J.A. Johnston, mayor, City Hall, Bluffton, Ind. Bids Mar. 1. Boyd Phelps, 1000 Washington St., Michigan City, Ind., engr.

Ind., Gary—S. N. Nielson Co., 3059 Augusta Blvd., Chicago 12, Ill., Contract Awarded, **$5,000,000.** Kirk Yard imprv. electrification switches, new yard, office, labor bldg., freight handling facilities, control towers, interlocking towers. Elgin, Joliet & Eastern R. R. Kirk Yard,Gary, Ind. Bids Nov. 15, awarded Mar. 5. Sverdrup & Parcel, 915 Olive St., St. Louis, Mo., archts.

Wash., Seattle—Smith & White, Pier 65, Seattle, Wash., Low Bidder, **$1,547,000.** 71 mi. double-circuit 230-kv transmission line, Bacon Creek to Bothell 9 mi. 2 double circuit 115 volt transmission lines. Bathell to Seattle. City, County-City Bldg., Seattle, 4, Wash. Bids Mar. 7.

INDUSTRIAL, COMMERCIAL & PUBLIC BUILDINGS

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Colo., Denver—General Services, Admin., General Services Bldg., F and 19 Sts. N. W., Wash. D. C. office, W. 6 Ave. at Kipling St. **$15,000,000.**

Fla., Flagler Beach—Lehigh Portland Cement Co., 718 Hamilton St., Allentown, Pa., cement plant, **$11,000,000.**

Ill., Chicago—State, 160 N. LaSalle St., Chicago, Zone 1, plans by C. Herrick Hammond, 53 W. Jackson St., Zone 4, mental hospital on grounds of State Mental Hospital at Dunning-Irving Park and Narragansett Sts., Zone 34, **$10,000,000.**

Mass., Natick—Quartermaster Dpt., Army Base, South Boston, research laboratory, incl. series 1 story bldgs. **$15,000,000.**

Tex., Wichita Falls—U. S. Eng., 1127 Texas and Pacific Bldg., Fort Worth, 525-bed hospital addn. at Shepherd Air Base. **$6,000,000.**

Low Bidders & Contracts Awarded

Louisiana—Gulf States Constr. Co., Inc., 1601 Perdido St., New Orleans, La. and Anthony Bertucci, 8600 Apricot St., Choimette, La. Contract Awarded, **$48,000,000.** aluminum plant, Chalmette, near New Orleans, La. Kaiser Aluminum & Chemical Corp., Airline Hy., Baton Rouge, La. Frank A. Backman, 536 International Trade Mart Bldg., Chalmette, La., engr. Awarded Mar. 7.

Tex., Port Lavaca—Al Johnson Constr. Co., 608 Foshay Tower, Minneapolis 2, Minn. Contract Awarded. Approx **$11,250,000.** Proj. 1, aluminum production pot line, incl. line, bldgs. other allied work at Fort Point; Proj. 2, aluminum production line, incl. required bldgs., line allied work, Port Neches; Proj. 3, 40,000 kw powerhouse, Port Lavaca; Proj. 4, 40,00 kw. electric powerhouse, Port Neches, plants, etc. Aluminum Corp. of America, Port Lavaca, Tex.

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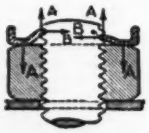

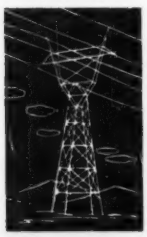

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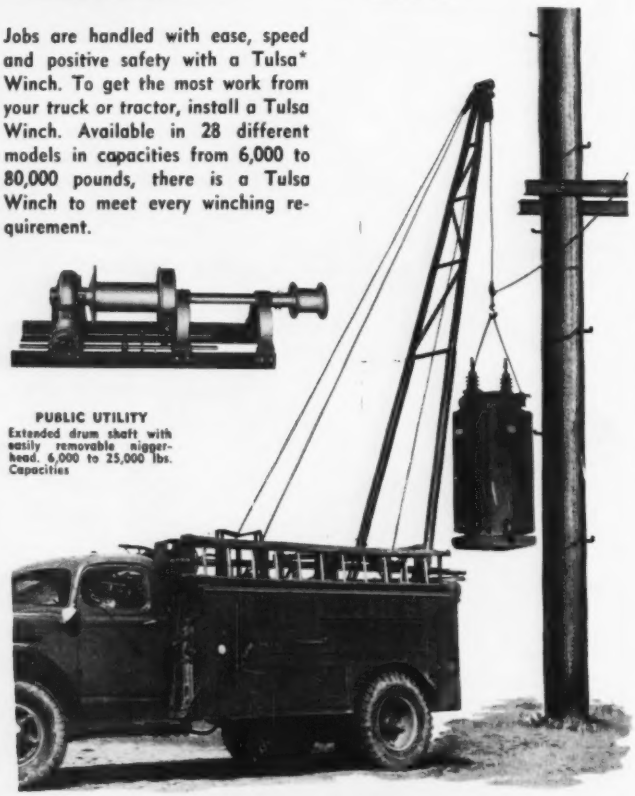

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TECHNICAL LITERATURE

Cavitation Erosion—Resistance of various metals to cavitation erosion is dealt with in *Accelerated-Cavitation Research*, reprinted from ASME Transactions. The paper is based on findings from tests run in an attempt to solve some of the phenomena of cavitation and to determine the relative resistance to pitting of recently developed materials and techniques for applying them. Author of the paper is W. J. Rheingans of Allis-Chalmers Mfg Co. Reprints may be secured for the asking from Ampco Metal, Inc, 1745 S. 38th St, Milwaukee 15, Wis.

Plasticity and Creep—Four phases of the subject are covered in *Symposium on Plasticity and Creep of Metals*. The papers, presented at the First Pacific Area National Meeting of ASTM in 1949, are: "The Experimental Exploration of Plastic Flow in Sheet Metals," "Forming Parameters and Criteria for Design and Production," "The Use of Creep Data in Design," "Super Creep-Resistant Alloys." Copies of Special Technical Publication 107 can be ordered at $1.50 each from American Society for Testing Materials, 1916 Race St, Philadelphia 3, Pa.

Flexible Cords—Standards covering four groups of multiple-conductor flexible cords are available: *Multiple-conductor Flexible Cords with Thermoplastic Insulation and Jacket, Types SVT, SJT and ST*, XC1-1950, $1; *Parallel Multiple-conductor Flexible Cords with Vulcanized Insulation and Jacket, Type POSJ*, XC2-1950, $1; *Single- and Multiple-conductor Flexible Cords with Vulcanized Insulation and Jacket, Types S, SJ, SO and SJO*, XC3-1950, $1; *Thermoplastic Parallel Multiple-conductor Flexible Cords, Types POTT 27 Awg, POT-64 18 Awg, POT-32 18 Awg and POT-32 16 Awg*, XC4-1950, $1. They may be ordered from National Electrical Manufacturers Association, 155 E. 44th St, New York 17, N. Y.

Attachment Plugs and Receptacles—*American Standard for Grounding-Type Attachment Plug Caps and Receptacles* covers the essential elements for interchangeability of caps and receptacles for grounding the noncurrent-carrying metal parts of portable appliances and devices. The two-page Publication WD1-1950 may be secured for 25¢ from National Electrical Manufacturers Association, 155 E. 44th St, New York 17, N. Y.

Welding—*Manual of Welding Engineering and Design* contains many pertinent tables, charts, illustrations, and descriptions in addition to considerable information on proper selection of the company's products for varying applications. Advantages of various methods of heating, design information for different joints, and joining-alloy selector charts are some of the sections of this booklet. Copies may be secured through Technical Information Service, Eutectic Welding Alloys Corp, 40 Worth St, New York 13, N. Y.

Vacuum Cleaner Cord—*Standards for Vacuum Cleaner Cord with Vulcanized Insulation and Jacket, Type SV* cover size 18 Awg two-conductor flexible cords with vulcanized insulation and jacket for light-duty service. Price of Publication XC5-1950 is $1 from National Electrical Manufacturers Association, 155 E. 44th St, New York 17, N. Y.

Cotton Fabric—Four new standards cover varnished cotton fabric and tape. Titles and publication numbers follow: *Black Straight-Cut Varnished Cotton Fabric*, VFI-1950, 70¢; *Yellow Straight-Cut Varnished Cotton Fabric*, VF2-1950, 70¢;

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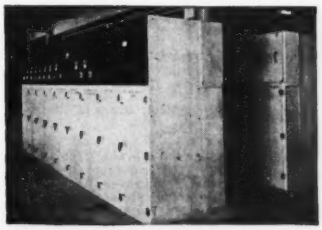

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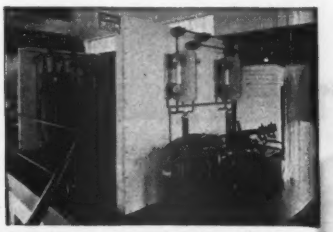

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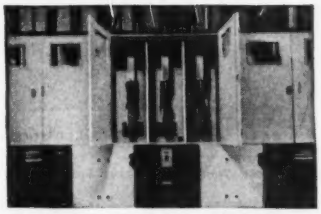

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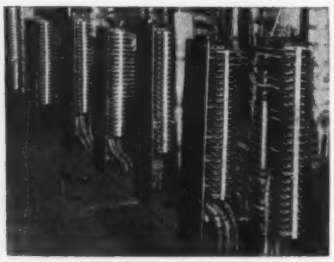

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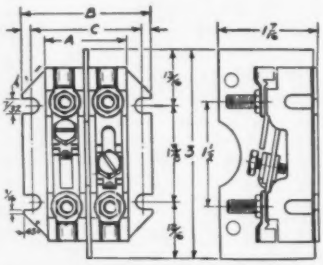

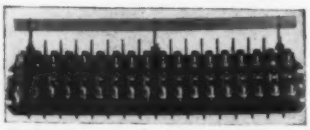

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Lightning Bibliography—*Lightning Reference Bibliography, 1936-1949*, contains 750 titles and the names of about 550 authors. Some of the sections give references on the following subjects: Lightning arresters and other protective devices, counterpoise, distribution, grounding, impulse testing, lightning measurements, lightning surge theory, rapid circuit breaker reclosure, shielding, transmission. Publication S-37 may be had for 70¢ by non-members, and for 35¢ by members, of American Institute of Electrical Engineers, 33 W. 39th St, New York, N. Y.

Crossarms—Covered in *Specifications for Dense Southern Pine Crossarms Preservative Treated* are crossarms made of longleaf pine, shortleaf pine, loblolly pine, slash pine, and pond pine. The specifications are intended for crossarms having cross-sections of not more than four inches on one face by not more than six inches on the other face. There are sections on manufacturing requirements, seasoning, preservative treatment, inspection, and definitions. Price of Publication TD-91 is 10¢ from Edison Electric Institute, 420 Lexington Ave, New York 17, N. Y.

Indicating Instruments—The first specifications for portable and laboratory indicating instruments approved by ASA are included in *American Standard for Electrical Indicating Instruments*. This new edition covers alternating and direct current instruments: Ammeters, voltmeters, single-phase and polyphase wattmeters, power factor meters, varmeters, and frequency meters. The charts cover 33 types of panel, switchboard, and portable equipment. For the first time in this standard,

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a new factor appears. This is the sustained operation influence defined as the change caused by energizing the instrument over extended periods of time over and above the indications of the instrument when first connected to the circuit. Values are assigned for this influence. This standard, C39.1-1951, may be secured for $1.60 from American Standards Association, 70 E. 45th St, New York 17, N. Y.

Stainless Steel—Technical data and information on workability of stainless steels is presented in a new slide chart. The chart includes a standard analysis table of stainless steels, together with their corresponding AISI type numbers, and gives relative fabricating data on the steels for a variety of operations. The chart may be obtained from The Carpenter Steel Co, Reading, Pa.

Spark Discharges—A research paper published in the Jan. 1 issue of the *Physical Review* presents new data on spark discharges in air. The authors, Fisher and Bederson of New York University's Dept of Physics, state that their experiments demand an extension of the streamer concept of breakdown. No transition region for change of streamer to Townsend breakdown was found. Information may be secured from Bureau of Public Information, New York University, Washington Sq, New York 3, N. Y.

Home Wiring—The new edition of the *Home Wiring Handbook* contains 135 pages with many charts and diagrams to simplify such problems as architectural lighting, location, and types of convenience outlets, two-wire and multi-wire circuits, and control centers. Circuit protection, communication systems, suggested specifications for single-family dwellings, and a system for estimating electrical costs are also a part of the handbook. Copies may be had at $1 each from Better Homes Bureau, Westinghouse Electric Corp, P. O. Box 868, Pittsburgh 30, Pa.

Metal Analysis—*The 1950 Book of ASTM Methods for Chemical Analysis of Metals* contains 39 extensive standards in 486 pages. Among the metals and alloys covered are ferrous metals, ferro-alloys, nickel-chromium-iron alloys, copper and copper-base alloys, aluminum and aluminum-base alloys, silver solders. Regular edition is $6.50, and an edition interleaved with blank pages for notes is $9, from the American Society for Testing Materials, 1916 Race St, Philadelphia 3, Pa.

Insulating Oils—Technical bulletin No. 50-DO is a discussion of contaminating effect of sludge, moisture, and carbonized particles on insulating oils and centrifugal equipment made by Sharples Corp for bringing up dielectric strength of such contaminated oils to 33 kv. There is explanation of the continuous centrifuging process and data on causes and effects of contamination. The bulletin may be secured from The Sharples Corp, 2300 Westmoreland St, Philadelphia, Pa.

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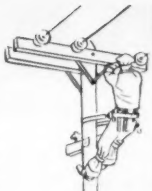

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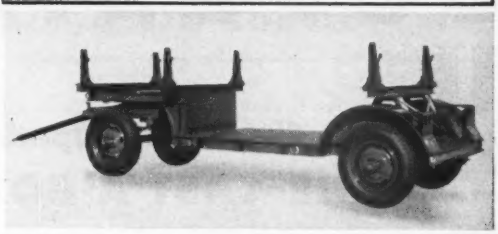

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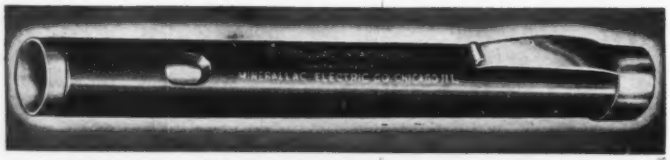

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CATALOGS • BULLETINS

● SWITCHGEAR: Reference is made in Bulletin 18B6185A to all types of indoor and outdoor switchgear with removable or stationary breakers, switchboards of all types, Ruptair replacement units, and substations of multi-circuit, single-unit, and load center design. Allis-Chalmers Mfg Co, 932 S. 70th St, Milwaukee, Wis.

● CIRCUIT BREAKERS: Information about the complete line of circuit breakers is contained in a new catalog. There are sections on panel CB's, auxiliary CB's, aircraft CB's, special purpose CB's, general purpose CB's with 50-amp frame, indoor and outdoor CB equipment. Heinemann Electric Co, Trenton 2, N. J.

● VOLT-AMMETER: Sixteen-page manual No. 110, "How to Make Your Job Easier with the Amprobe", describes use of this snap-on volt-ammeter when installing, repairing, or maintaining electrical equipment. Pyramid Instrument Corp, 49 Howard St, New York 13, N. Y.

● UNIVERSAL JOINTS: Information for selection of universal joints, engineering data, and graphs are in Catalog C1. Manufacturer's applications include transformer tap changer, wire drawing machinery, stoker drives, steam turbine valve controls and governor controls. Curtis Universal Joint Co, Inc, Springfield 7, Mass.

● SOOT BLOWERS: Central station installations of Vulcan automatic sequential soot blowers appear in Bulletin 484, along with many photographs and illustrations. Vulcan Soot Blower Div, Continental Foundry & Machine Co, Dubois, Pa.

● INSTRUMENTATION: In condensed Bulletin Z 6600 is a selection of typical Wheelco recorders, indicators, controllers, and combustion safeguards. They are illustrated and briefly described. Wheelco Instruments Co, 847 W. Harrison St, Chicago 7, Ill.

● LUMINAIRES: General diffuse fluorescent luminaires are covered in Magna-Lite Bulletin AL-A 2-4. There is information on reflectance, efficiency, sizes and number of lamps available, mounting, and construction details. Metalcraft Products Co, Inc, 306-308 Cherry St, Philadelphia 6, Pa.

● DISTRIBUTION TRANSFORMERS: Various types of air-cooled power centers are shown in 4-page Bulletin 50-FC. Type F, 1,000-kva unit substation is shown in cut-away. Marcus Transformer Co, Inc, 32-34 Montgomery St, Hillside 5, N. J.

● STEAM TURBINE UNITS: Photos and cross-section drawings of most units—11,500, 15,000, 20,000, 30,000, 40,000, 60,000, and 90,000 kw—appear in 16-page Bulletin 03B6801A. Features and accessories furnished with the standardized turbines are listed along with bills of material for hydrogen and air-cooled generators. Allis-Chalmers Mfg Co, 932 S. 70th St, Milwaukee, Wis.

● LIGHTING: Description and application of Abolite reflectors, sockets, holders, and accessories appear in a new 1950-51 Catalog and Handbook. It also contains new ideas on plant lighting and flood lighting. The Jones Metal Products Co, West Lafayette, Ohio.

● LINEMAN'S SUITS: Lineman's suits and accessories are briefly described and pictured in a four-page 1951 Catalog. W. V. Haynes Co, 100 South Bay Ave, Boston 18, Mass.

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BOOK REVIEWS

Relay Systems

Silent Sentinel. **Meter Division, Westinghouse Electric Corp., Newark, N. J. 236 pages, illustrated $3.50.**

This latest of several editions of Silent Sentinels, first published in 1924, chronicles many problems of application and the various types of relays and relay systems available for their solution. Of outstanding practical usefulness are the characteristics tables for wire and cable, the table of potential coil burdens of protective relays and the application chart covering 97 relay types. The book's 19 chapters are divided into two classifications; 11 chapters covering fundamentals of the application of protective relays, and 8 on protective relaying equipment. Then of the post war relay developments covered are: (1) Addition of single sideband carrier equipment to type JY Power Line Carrier Line, (2) single-pole carrier relaying and reclosing using HKB carrier scheme, and (3) development of the type HXS reactance ground relaying system.

Commercial and Industrial Lighting

Electric Illumination, **2nd Edition. By John O. Kraehenbehl. Published by John Wiley & Sons, Inc, New York 16, N. Y. 446 pages, illustrated. Price $8.**

This book presents the principles underlying the specification and design of lighting for commercial and industrial buildings. The new edition incorporates the changes and developments that have occurred since publication of the first edition in 1942. Important topics included are objective and subjective specifications of illumination, color and shadow, light control, illumination from point, line and surface sources, luminous architectural elements, floodlighting, novelty lighting, and installation maintenance and economics. The material has been thoroughly revised and new illustrations and appendixes added.

System Stability

Power System Stability. Vol II. **By E. W. Kimbark. Published by John Wiley & Sons, Inc, New York 16, N. Y. 288 pages, illustrated. Price $8.**

Volume II builds up on the content of Volume I (elements of stability calculations) to establish an analysis of circuit protection by means of relays and circuit breakers. The equipments are discussed in terms of the functional design, ratings and maintenance. The explanation of relaying technique is one of a very few book sources available and the effect of out-of-step and system swing conditions upon the relays is particularly unique. Rapid reclosure is the subject matter of the closing eleventh chapter. Bibliography at the end of each chapter is prolific and comprehensive.

Steel Furnaces

Production of Electric Steel (Electrostahl-Erzeugung). **By Sommer and Pollack. Published by Stahleisen, Dusseldorf, Germany. 338 pages, illustrated. Price 34 German Marks.**

Treatment is confined to the various types of electric furnaces, their design, construction, operation and upkeep. First there is clear and simple exposition of the theory underlying the arc, induction and resistance types, followed by discussion of refractories suitable for the high temperatures. Description of construction details is unusually detailed and so is the subject matter on operation. Of particular significance is the analysis of the consequences of agitation and of applying gases. Finally costs are compared with alternative processes. (W. Trinks)

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150	G.E.	IE	1800
150	*Al-Ch	AW	1800
125	Westg (new)	CS584	1800
125	G.E. TEFC	K63265	1200
120	G.E. (new)	K6333	900
100	*G.E.	FT542Z	1800
100	U.S. (Vert)	CFU	1200
100	Westg	CS	1200
100	G.E. (new)	K6333	720
75	Westg	CS761	1800
75	G.E.	K585	1200
75	G.E.	K6333	720
75	*G.E.	IK	720
60	G.E. (new)	K444S	1800
60	G.E. (new)	K504U	1200
60	Al-Ch	AR826F	514
50	U.S. (vert)	SCW	1800
50	Westg	CS574	1200

Hundreds of Smaller Motors!

MOTOR GENERATOR SETS

K.W.	MAKE	A.C.	D.C.
550	W-G.E.	2300	125
500	Westg	2300	250
500	Westg	550	250
500	Cr.-Wh.	220–440	250
450	G.E.	2300	250
400	Westg	2300	600
250	Westg–G.E.	440	250
200	G.E.	440	250
150	G.E.	2300/440	250
150	Cr-Wh	440	250
150	Al-Ch	220	125
100	G.E.	440	250
100	G.E.	220	250
75	Al-Ch	440	250
75	Westg	2300	115
60	Al-Ch	2300	115
40	Cr-Wh	220	125
40	Al-Ch	440	250
30	Cr-Wh	220	125
25	G.E.	440	250

DIRECT CURRENT MOTORS

230 VOLT

H.P.	MAKE	TYPE	SPEED
375	Westg	PED	650
200	Westg	SK210	800
200	Reliance	1970T	675
175	G.E.	ELC11	750
100	G.E.	RC34	2500
100	Westg	SK173	850
100	Al-Ch	E152	575
40	G.E.	CO2804	600
35	Cr-Wh	CM351	700
35	G.E.	C	600

SLIP RING MOTORS

3 Phase, 60 Cycle, 220 or 440 Volts (*2200 volts or higher)

H.P.	MAKE	TYPE	SPEED
2000	*G.E.	MT30	240
1200	*Cr-Wh		240
550	Westg	HE	350
500	Westg	CW	350
300	*G.E.	IM	1800
200	G.E.	IM	1800
150	Westg (new)	CS772C	1200
125	G.E. (new)	M6334	720
100	G.E.	MT	1800
100	Westg	CW	600
75	Star	6500	900
60	Westg	CW	900

TURBINE SPECIAL
312 KVA Crocker-Wheeler AC Generator, 3/60/240/480 volt, d/c to 375 HP Worthington-Moore Turbine, Single Automatic, Non-Condensing 425 lbs PSI, 10 lbs. Exh., 100°F SH with Reduction Gear and Accessories.

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NEW 1000 AMP.
40 volt, type NPT, d/c 60 H.P. Chan. A-28 Syn. Motor 3/60/220, 600 RPM, 25 deg. cont.

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TURBO GENERATORS

Qu	KW	Make	Desc.
2	—750	G.E.	Condensing — 425 lbs. 750 TT. I.S.P. 440v. 3 ph. 60 cy —Built 1944
1	—625	Westg.	Non-cond. 125 lbs. I.S.P. 5/20 lbs. B. P. 440 v. 3 ph. 60 cyc.
1	—400	Westg.	Non-condensing—125/150 lbs. I.S.P. 5/10 lbs. B.P.—240/480 v. 3 ph. 60 cy.
1	—300	G.E.	Non-condensing 150/175 I.S.P. 5/10 B.P.—480 v. 3 ph. 60 cy.

SYNCHRONOUS CONDENSERS

KVA	Make	Type	Volts	Speed
1—5140	Whse.		2400/4150	600
1—4000	G.E.	TSC	2400/4150	900
1—3000	Whse.		2400/4800	720

MOTOR GENERATOR SETS

3 ph. 60 cy.

Qu	KW	Make	Speed	DC Volts	AC Volts
2—	2000	G.E.	500	668 25 cy	11000
1—	1800	G.E.	600	125/250	2300/4150
1—	1500	G.E.	360	275	2200/4400
1—	1000	Whse.	900	600	4150
1—	1000	G.E.	900	600	2300/4150
1—	750	G.E.	900	275	4150
1—	750	Whse.	900	275	2300/4150
1—	500	Whse.	900	250	440
1—	500	G.E.	720	125	2300
1—	400	G.E.	720	250	440/2300
1—	350	G.E.	900	125	4150

TRANFORMERS—60 Cycle

KVA	Make	Type	Ph	Voltages
2—4000	G.E.	HT	3	22000x2300
3—2666	Whse.	OISC	1	66000x11000
3—1250	G.E.	HVDDJ	1	6600x550
3—333	Phts.	OISC	1	26400x2800
6— 250	G.E.	HT	3	12200x240 480
12—250	G.E.	HT	3	2400/4150x240/480

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3–150 K.W. DIESEL GENERATOR SETS

Buckeye–600 r.p.m.–medium speed Westinghouse generator–440/3/60–complete with modern dead front switch gear. Units equal to new–used only 50 hours.

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UNIT CAPACITIES—10 TO 1875 KVA
A.C.—50 AND 60 CYCLES
VARIOUS VOLTAGES

A PARTIAL LISTING OF OUR INVENTORY

KVA	Make	Model	HP	RPM	KVA	Make	Model	HP	RPM
1875	Fairbanks Morse	33F16	2000	300	375	Enterprise	DSG–6	450	450
1420	Fairbanks Morse	38D8¼	1600	720	330	Superior	KNA	398	514
1250	General Motors	16–278A	1600	720	312	General Motors	8–268A	400	1200
937.5	General Motors	12–567	1080	720	312	Clark	MD–4	375	327
625	Alco	6–12¼x13T	750	600	187	Ingersoll Rand	8	225	514
438	Baldwin	VO–6	510	450	125	General Motors	3–268A	180	1200
400	Buckeye	80	480	600	75	General Motors	6043C	90	1200

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A. G. SCHOONMAKER COMPANY, INC.
ENGINE DIVISION, 50 CHURCH ST., NEW YORK 7, N. Y.

LETTERS TO THE EDITOR

Commissioners Answer

To the Editor:

I have received your public letter of January 2, 1951, in which you commented upon the report of the President's Water Resources Policy Commission.

The recommendations made in that report represent the judgment of all members of the commission as to the water policy which would advance the public interest, and they were made after thorough study of all materials presented to the commission.

Gilbert F. White
Vice Chairman
President's Water Resources
Policy Commission
Washington, D. C.

To the Editor:

This acknowledges your letter of January 2 which was published in the "Electrical World" of January 8 concerning the President's Water Resources Policy Commission report.

In preparing the report the commission considered carefully the material presented at the field conferences, including statements by the electric utilities, and unanimously recommended those policies which would, in its judgment, best protect and promote the interests of the American people.

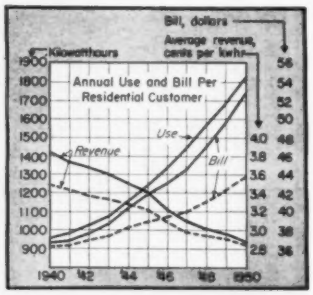
Roland R. Renne
President's Water Resources
Policy Commission
Washington, D. C.

A Matter of Scales

To the Editor:

As an engineer I appreciate your editorial in the Jan. 8 issue. Very few nowdays have the opportunity and the will to publish such analyses.

Now that I've given a deserved compliment I wish to present a fault-finding comment on the inside block on page 16 [of the same issue]. To present a correct figure the values at right of chart should be different . . . let the difference between lines "Average Revenue, Cents per Kwhr" be 3 mills (instead of 2) and the interval between lines for "Bill, Dollars" be



4.5 (instead of 2). The curves "Use" and "Bill" present an inaccurate picture—with a declining unit the "Bill" follows the "Use" when it should start at the "900" value at left and sweep across to the "3.6" at right.

John A. Davenport
3309 Lambert Place
Cincinnati, Ohio

(Editor's note: The point made by reader Davenport is well taken. On the chart above, the dotted lines show where the curves for "Use" and "Bill" would have fallen if "Electrical World" had used the scales.

Misquoted on Termites

To the Editor:

I realize it is a long way between the . . . conference in Honolulu, Nov. 30 and the Dec. 18 issue of "Electrical World," published in New York, but I must report that I was misquoted on page 75 of that issue.

I stated that the Hawaiian Electric Co, Ltd, has installed about 13 lineal miles of residential underground systems [non-leaded cable] since 1945 . . . and that to date we have had three failures of non-leaded cables definitely attributed to termites . . . and that only one of these was a neoprene-jacketed cable. I did *not* intend to imply that neoprene-jacketed cables were less susceptible to termites.

The area where the direct burial cable failures occurred is badly infested with coptotermes formosanus termites. The only thing we have found that will kill these termites and not harm the cables is sodium pentachlorophenate dispersed in water, but this is a lethal plant killer and cannot be used at many places . . .

C. H. Williams
Principal Electrical Engineer
The Hawaiian Electric Co, Ltd
Honolulu, Hawaii

Cable Sheath Protection

To the Editor of Electrical World:

In the "Technical Notes" column in the January 29th issue of "Electrical World" it was stated that lead was losing its secure place as the prime material for protective cable sheathing and that the trend is to use synthetic resins for protection.

There is no question about the diminishing use of lead, especially in rubber insulated cables, which started over 20 years ago. I must take issue, though, with your statement on synthetic resins, unless you have applied this term in a very loose sense. The synthetic resins used with insulated wire and cable are generally thermoplastic materials, such as polyvinyl chloride and polyethylene. These are employed both for insulation and for protective coverings.

Nevertheless, by far the most important sheathing material today for power cables is neoprene, a thermosetting material that, upon vulcanization, retains its dimensional stability over a wide temperature range. Neoprene is the most extensively-used covering for rubber-insulated power and control cables in power plants and heavy industry and on the railroads for signal wire. It is also being supplied as protection over the lead sheaths of paper-insulated cables.

Lead is the only sheath material that is totally moisture-tight, and the industry continues to use it for paper cables because no non-metallic synthetic can give equally long and reliable protection against moisture. Lead, though subject to electrolytic and chemical corrosion, can be protected by an outer covering. There is a trend toward such protection . . .

Richard S. Hayes
Advertising Manager
The Okonite Co
Passaic, New Jersey

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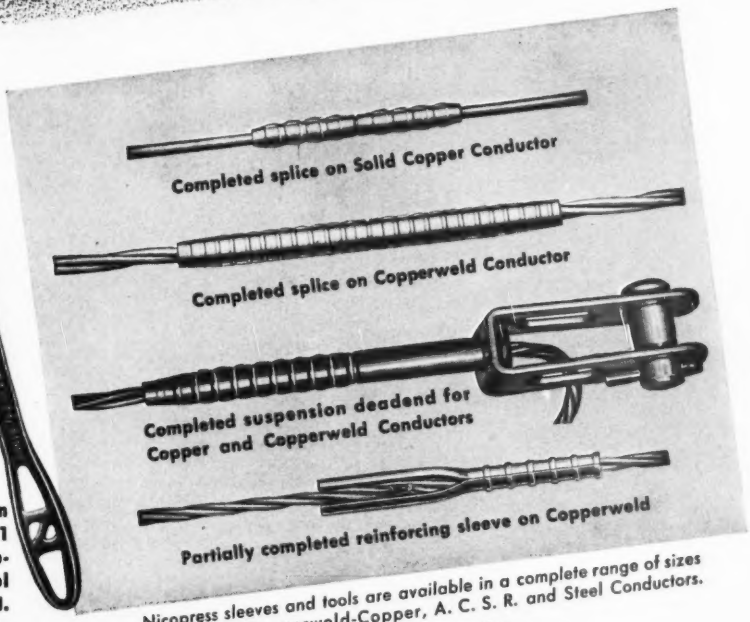
Illustration of No. 51 type Nicopress tool with P. & J. Grooves.


Completed splice on Solid Copper Conductor
Completed splice on Copperweld Conductor
Completed suspension deadend for Copper and Copperweld Conductors
Partially completed reinforcing sleeve on Copperweld

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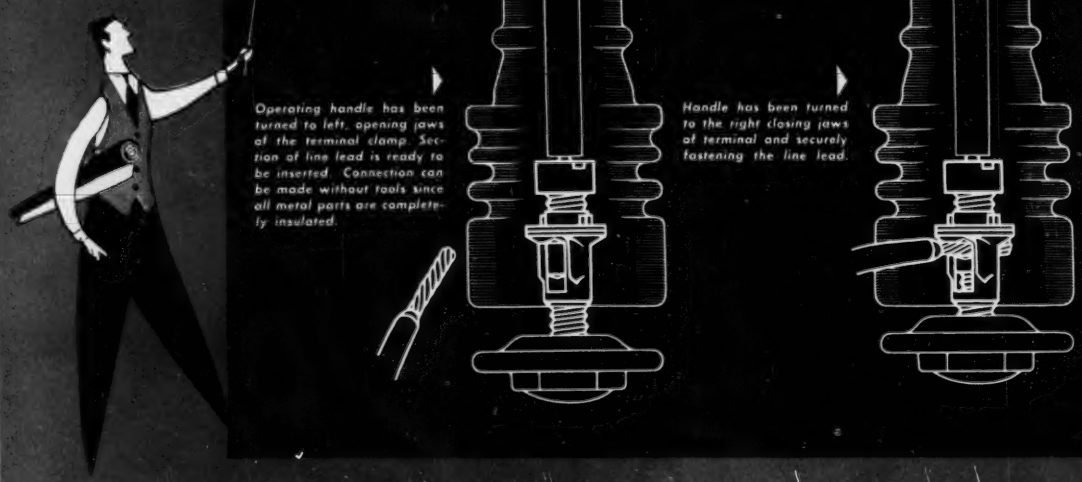

Operating handle has been turned to left, opening jaws of the terminal clamp. Section of line lead is ready to be inserted. Connection can be made without tools since all metal parts are completely insulated.

Handle has been turned to the right closing jaws of terminal and securely fastening the line lead.

Here's the bushing terminal that is rapidly becoming the choice of transformer buyers all over the country . . . the Kuhlman "Quick-Grip!" Specified by utility engineers everywhere, many other transformer manufacturers have copied its design features.

Ask any lineman what he thinks of the Kuhlman "Quick-Grip." Let him tell you how it eases and speeds his job of making line connections by eliminating use of tools. All he does is insert the lead into the hole in the side of the bushing and secure the connection by simply turning the handle on the end of the terminal. That's all there is to it! The clamp accommodates full range of wire sizes prescribed by EEI-NEMA Standards; mounting hardware is inside the tank protected from corrosive effect of the atmosphere.

The "Quick-Grip" is favored too, because of its safety features. Heavy insulating knob prevents accidental contact with live parts. Lead enters through side of bushing eliminating necessity of gripping over the lead when making connections as in the case of a rotating chuck type terminal. Since there is only one entry hole for the lead, its sharp point cannot protrude on the opposite side of the bushing to be a hazard to the lineman.

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